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Electronics Australia

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Your guide to BIG SCREENS

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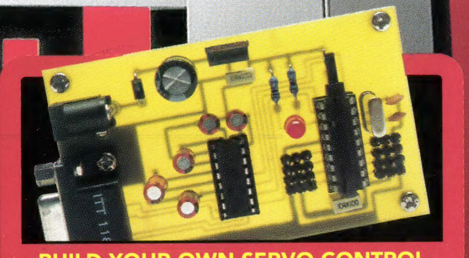
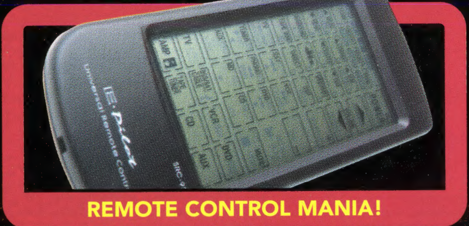
SURROUND SOUND

Inside Pioneer's Vision Plus home theatre system



BUILD YOUR OWN SERVO CONTROL

RADICAL DIGITAL CAMERA



REMOTE CONTROL MANIA!

PLUS:

- How it works
- Fake lunar landings?
- Hall effect sensors
- 4-valve sets of the 1920s
- Serviceman index
- Build a reaction timer!
- More tranceiver trouble
- Designing preamps
- 40V/3A power supply

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PHILIPS

Let's make things better.

The Snowball effect

I've had a few letters recently, asking why we are covering so many DVD players and other home theatre equipment — surely there's more out there to review?

Well, that's a fair question, and the answer is that it is simply because home theatre is happening in a very big way at the moment.

Look back, and you'll see that the cost of setting up a surround sound system with a large-screen TV has dropped dramatically over the last year or so. Why has it dropped? Because every man and his dog is bringing out DVD players, surround sound decoders, and projectors. And why are they doing this? It's the Snowball effect: they are, because everyone else is...

This process will stop as soon as the retail price of these items drops to a level where it isn't economically viable to produce new models. When they reach this point, the manufacturers will turn to a new, un-tapped market — and start all over again.

We've seen it with radios, televisions, VCRs, and inkjet printers. We are just coming to the end of mobile phones, digital cameras and video projectors, and still have DVD players, palm computers and surround sound systems to go. But what then?

Whatever it is, EA will there giving you in-depth reviews and keeping you informed as to the latest technology on the market. We've been doing this for over 78 years now, and have covered every technological achievement from the first radio broadcasts in Australia to the social impact of the MP3 sound compression algorithm.

If it's happening in the world of electronics, you'll read about it here — keep up to date with today's technology and read EA!

Graham

Graham Cattley, Editor

Editor	Graham Cattley			
Technical Editor	Rob Evans, CET (RMIT)			
Contributing Editor	Jim Rowe, B.A., B.Sc., SMIREE, VK2ZLO			
Design	Carlos Alzamora			
Contributors	Jean-Baptiste Cattley; Stewart Fist; Roger Johnson, VK5ZKP; Jim Lawler, MTETIA; Tom Moffat, VK7TM; Peter Phillips, B.Ed., Dip Ed., ECC; Darren Yates B.Sc.			
Photography	Phil Aynsley, Kevin Ling, Greg McBean, Michael Pugh			
Drafting	Alberta Cattley			
Reader Services	Ana Marie Zamora	**e** elt@fpc.com.au	**t** (02) 9353 0620	**f** (02) 9353 0613
Advertising Manager	Ian Bellert	**e** ibellert@fpc.com.au	**t** (02) 9353 0734	**f** (02) 9353 0613
Vic	Kayren Browne		**t** (03) 9864 1222	**f** (03) 9864 1211
SA	Sue Bowshall		**t** (08) 8352 7937	**f** (08) 8352 6033
WA	JWP Media Specialists		**t** (08) 9450 3200	**f** (08) 9450 3211
Ad production	Pamela Sceats		**t** (02) 9353 0629	**f** (08) 9353 0997
Subscriptions Enquiries	1300 656 933 (Int: +61 2 9353 6666)		**t** (02) 9353 6666	**f** (02) 9353 0967
Suscriptions Email	subs@fpc.com.au			
Production Manager	Brett Baker			
General Manager	Geoff Baggett			
Editorial Director	Christine Whiston			
Marketing Manager	Kelly Hobby			
National Sales Director	Rick Nicholson			
Circulation Director	Steve Maidens			
Head office	FPC Magazines, P.O. Box 199, Alexandria, NSW 1435			
Street Address	180 Bourke Rd., Alexandria, NSW 2015		**t** (02) 9353 0620	**f** (02) 9353 0613
Email	electaus@fpc.com.au			
Website	www.electronicsaustralia.com.au (Watch us while we work, on the EA Webcam!)			
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INDEX

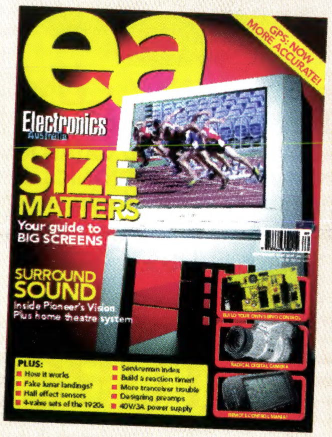
PROJECTS
PIC Servo Controller . . . . .Sept 2000
Experimenting W E - Transistors 3 . .Sept 2000
$10 Wonders - Reaction Timer . . . .Sept 2000
Gameboy I/O Interface . . . . .August 2000
60 Second Voice Recorder . . . . .August 2000
Experimenting W E - Transistors 2 August 2000
PC Powerup . . . . .August 2000
Video Fader . . . . .July 2000
$10 Wonders - Rev. Motor Drive . . .July 2000
Experimenting W E - Transistors 1 . .July 2000
$10 Wonders - the Urgent Alert . . .June 2000
8-channel IR Remote Control . . . . .June 2000
Experimenting W E - Opamps 4 . . .June 2000

REVIEWS
Pilot SRC-9200 Universal Remote . .Sept 2000
Pioneer Vision Plus surround sound system . . . . .Sept 2000
Powertech MP-3092 power supply .Sept 2000
Bose Lifestyle 50 . . . . .August 2000
SpyCam video camera . . . . .August 2000
Hiteker AD-600A DVD player . . . . . .July 2000
Pioneer PDR-509 CD Audio Recorder .July 2000
Denon DVD-1500 DVD player . . . . .July 2000
Pioneer PD-F1007 CD player . . . . .June 2000
Kinyo Surround System . . . . .June 2000
Hitachi CP-X940 projector . . . . . . .June 2000

FEATURES
High accuracy GPS systems . . . . . .Sept 2000
Big TVs for the Olympics . . . . .Sept 2000
Bionic Man . . . . .August 2000
Sensor modelling in SPICE . . . . .August 2000
Games Consoles . . . . .July 2000
Dependable Automotive systems . . .July 2000
Wide Field Imaging . . . . .June 2000
Gameboy Programming . . . . .June 2000

HOW IT WORKS
Safety switches (ELCBs) . . . . .Sept 2000
Microwave Ovens . . . . .August 2000

ON THE COVER



Thinking of getting a big screen for the Olympics? Check out our guide to big screen technology, starting on page 18. (Image used with the permission of the National Sport Information Centre, Australian Sports Commission.)

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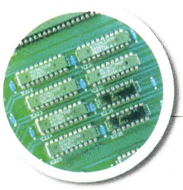


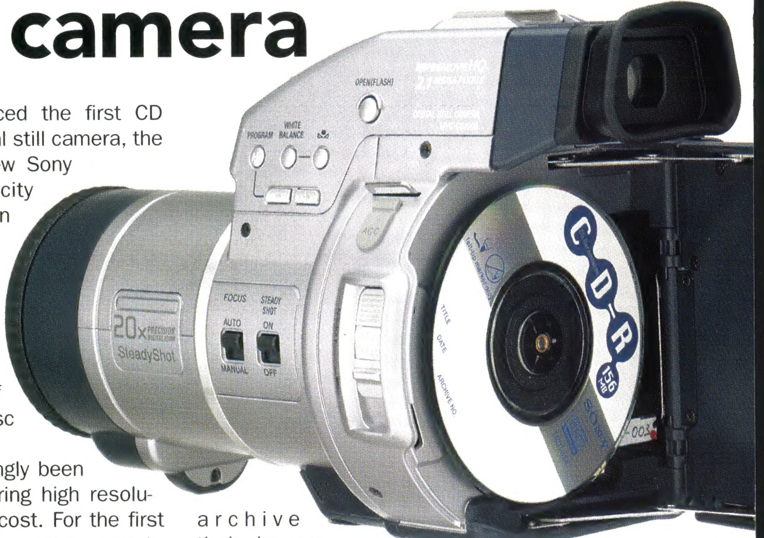
WHAT'S NEW

IN THE EVER CHANGING WORLD OF ELECTRONICS

THIS MONTH

- Sony Mavica CD-R Digital Camera.
- SAST AEP-803 DVD/MP3 Player.
- Dick Smith Electronics Cybug Solar Powered Fly.
- Toshibas Portege 7220Cte Laptop Computer.
- Denon DCM-5000 100-disc CD Changer.
- Panasonic SL-series Portable CD Players.
- Panasonic NVDS15A Digital Video Camera.
- Denon D-G1 Micro Hifi System.
- Kodak 4832E USB CD-R Writer.
- QuickLink Handheld Scanner.
- JVC GR-DVL9800 Mini DV Camcorder.
- Dick Smith Electronics Binoculars.

World's first **CD-R digital camera**



Sony Australia have announced the first CD Recordable (CD-R) based digital still camera, the Mavica MVC-CD1000. The new Sony Mavica uses a high-capacity 156MB 3.5-inch CD-R in an easy-to-use camcorder styled camera.

Each CD-R for Sony's new CD-R Mavica camera can hold up to 160, 1600x1200 (2.1 megapixel) images, the equivalent of more than four rolls of 36-exposure film, on an $8 disc with no processing required.

"Australians have increasingly been demanding a medium for storing high resolution images at an affordable cost. For the first time, the MVC-CD1000 enables consumers to archive their images at a very cost-effective 5c per megabyte, or 10 times cheaper than floppy disk," said Sony Australia's Product Manager for Personal Video, Mr Yoji Higashida.

Above and beyond the innovative use of CD-R technology, the Mavica MVC-CD1000 offers advanced picture quality, including 2.1 megapixel resolution and the ability to shoot in TIFF and high quality MPEG (MPEG HQ) modes. Sony's implementation of the CD-R format enables faster image processing, dramatically decreasing image recording time. Images captured with the MVC-CD1000 can be recorded in several modes, including JPEG compression or TIFF in images sizes up to 1600 x 1200 pixels.

DVD with the lot!

OK, so you are looking to buy a DVD player, but aren't sure which features to look for. Well, how about one that has the lot? The SAST AEP-803 is a DVD player that can handle MP3s, Video CDs, Super VCDs and compact discs. It is NTSC and PAL compatible, and to top it all off, it is region free as well.

The SAST has a built-in DTS/PCM/Dolby Digital (AC-3) decoder, giving 5.1 channels of surround sound, along with a DTS optical digital output via fibre or coaxial sockets. It offers karaoke microphone inputs, and standard analog and S-Video outputs.

■ ***You also get a full-function remote control, and a 12 months return to base warranty for — wait for it — $499 including tax. For further details, contact Frenetic on (02) 9660 3388, or via email at nelson@frenetic.com.au. Website at: www.frenetic.com.au.***

The MVC-CD1000's powerful combination of high resolution and 10x optical zoom - equivalent to a 35mm camera's 390mm lens - enables the MVC-CD1000 to fill the screen with subjects from a greater distance and capture them with increased clarity. Working with the powerful zoom, Sony has also added features rarely seen in the digital camera marketplace, including a through-the-lens viewfinder using a bright colour LCD to ensure that what you see is what you shoot.

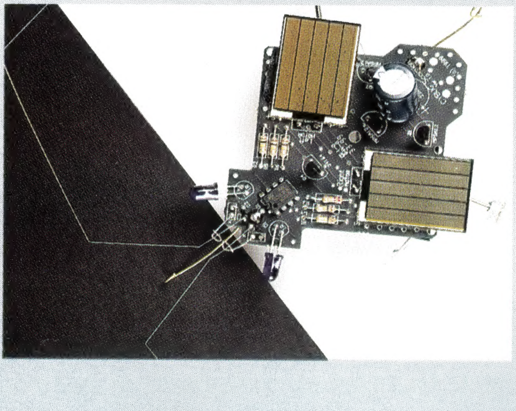
■ *The Mavica MVC-CD1000 ships with five one-time writeable CD-Rs and will be available for $2,999. For information regarding the nearest Sony authorised dealer or service location, call 1300 13 SONY (7669) or visit* ***www.sony.com.au.***

Solar powered **fly**

The Cybug Solar Fly is a robotic life-form whose energy source comes directly from the sun. The Cybug will continually explore its surroundings and make its way towards the sunniest spot it can find.

Very active in direct sunlight, the Cybug has sensitive infra-red eyes that continually cause it to move towards the brightest object it sees. The Fly's feelers help it to navigate its way around obstacles and it even has a short-term memory about objects it comes into contact with.

■ *The Solar Fly comes with PCB, solar panels, motor, easy-to-read instructions and all components The kit is available for $71.31 from Dick Smith Electronics stores Australia wide, or via mail order by calling 1300 366 644 or visiting their website at* ***www.dse.com.au.***



Micro hifi

THAT some of the best things come in small bundles has never been truer than in the case of Denon's new fully featured integrated micro hifi system, the compact D-G1.

To meet the needs of modern living, there has been an explosion in the number of systems now available in Australia that will fit comfortably on the living room bookshelf, but the new Denon D-G1 micro system stands alone in providing the highest quality componentry with European-inspired design and sound performance at a price of just $799.

The D-G1 system includes a high-output 20W x 20W receiver/amplifier, 4-mode graphic equaliser, CD player, cassette tape deck, and a pair of top-quality, European-influenced 2-way speakers. The D-G1 speakers feature soft dome tweeters and woofers with pearl mica cones. The combination of the two produces a clear, lively sound, rich with musical details.

The system also includes a bass control function that enriches the deep bass sound, further defying the modest size of the speakers. You can enjoy this reinforced bass foundation even at relatively low volume levels. Among its sound features is the graphic equalizer that lets you choose any of four sound spaces — rock, pop, classical, and flat to enjoy the type of music you want to hear.

■ *The Denon D-G1 has an RRP of $775. For further information, call Audio Products Australia on (02) 9669 3477, or email enquiries to info@audioproducts.com.au.*

CD-R – to go!

HOT-SWAPPING and transporting your CD-R writer is now possible with the Kodak 4832e CD-R/RW external USB writer.

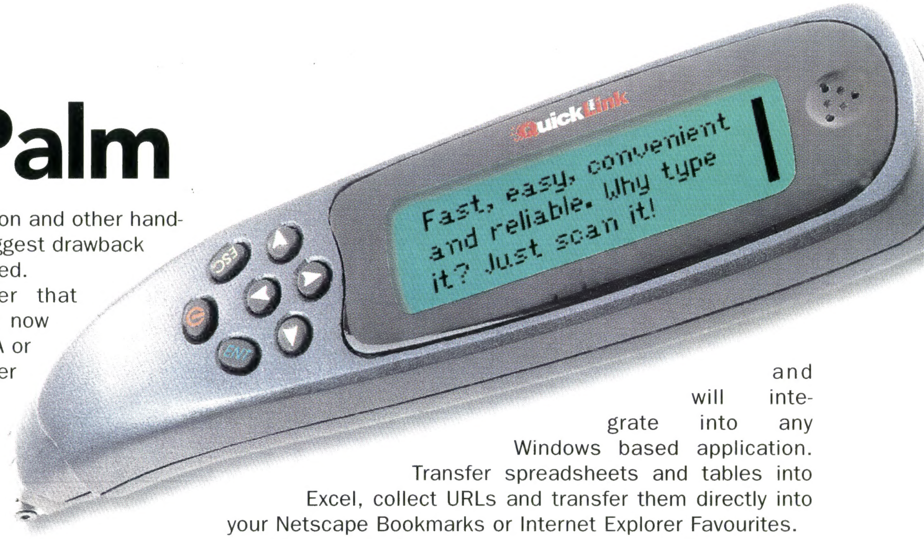
The 4832e External USB CD-R/RW USB drive is a 4x CD-R record, 4x CD-RW record and 8x read device. It uses a standard USB interface and is hot-swappable so users do not have to shut down their computer to add or remove the drive. Users can easily connect and share CD recording capability between different PCs, including desktops and laptops.

The 4832e drive comes with the latest version of Adaptec Easy CD Creator software, the world's leading CD writer software, allowing simple backing-up or copying of data, images and music. The drive also comes with DirectCD software, which allows users to access the drive just like a hard drive or floppy drive.

The Kodak drive is capable of recording in standard CD formats such as the ISO9660 CD-ROM (data) format, Mixed-Mode, CD Extra, Multisession, Bootable and Direct CD format. Direct CD allows users to treat the CD-R or CD-RW discs like a floppy disk by simply FileSaving from their favourite application, or simply dragging and dropping files as required. This level of functionality makes the drive extremely useful for a broad range of people from home through to business users.

■ *The new Kodak 4832e External USB CD-R/RW Writer kit is available through Kodak's usual CD-R media and digital camera channels and will have an RRP of around $699. For additional information about the 4832, visit the Kodak website at:* ***www.kodak.com****, or call 1300 130 674.*

Stick it in your Palm


QuickLink
Fast, easy, convenient and reliable. Why type it? Just scan it!
ESC
ENT

FOR ALL THOSE users of PalmPilot, Psion and other handhelds who find that data entry is the biggest drawback — your prayers are about to be answered.

QuickLink, the hand-held scanner that swipes type straight into your PC can now beam it to the infrared port on your PDA or the new USB adaptor providing another handy option to the existing serial connection and the new IR capability.

QuickLink is like a hi-tech highlighter that can scan notes from any printed form, business cards, address books, newspapers, books or magazines and store up to 1,000 pages of text in the pen.

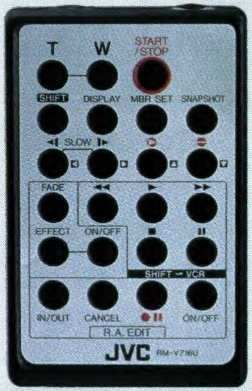
The text can be transferred directly to your PC or laptop via the serial, USB or IR port, and scanned directly into Microsoft Word, Outlook or Excel on your computer or directly to your organiser.

QuickLink is fully compatible with all Microsoft Windows operating systems (including '95, '98, 2000, NT, 3.1 & CE) and will integrate into any Windows based application. Transfer spreadsheets and tables into Excel, collect URLs and transfer them directly into your Netscape Bookmarks or Internet Explorer Favourites.

This remarkable pocket scanner, with a retail price under $400, will be invaluable to executives, especially in transit, lawyers, doctors and students who need to collect excerpts often from bulky documents or anyone who'd rather swipe it than type it.

■ *For more information please contact: Wizcom Technologies on 1800 09 2000, or email info@wizcom.com.au.*

Mini DV camcorder



JVC's new digital video camera features the highest resolution DV recording available today, with a new progressive scan CCD.

Featuring a progressive scan 800,000 pixel CCD and high-band processing technologies, JVC's GR-DVL9800 not only delivers the DV picture resolution that is the industry's highest, it can also be used to take high-quality XGA (1024 x 768 pixel) digital stills which it stores separately on a removable MultiMedia Card. Users can even shoot still images while recording motion pictures thanks to the camera's dual shooting capability. Video, image editing and processing software is also included.

■ *For more information, contact JVC Consumer Products on 1800 225 044, or email info@jvc-australia.com.*

Looking good

OK, so they aren't very electronic, but we were so impressed by the quality of these 10x25 binoculars from Dick Smith Electronics that we just had to try them out. The verdict? Not bad. In fact they're pretty good.

■ *If you are off to the tennis, the cricket, an outdoor concert or even the Olympics, these binoculars are just the ticket. They're only $41.01, so check them out at your nearest Dick Smith or Powerhouse store.*

Email for technophobes

HATE all that computer geeky stuff, but would like to send emails? Cidco Inc may have the answer for you with the MailStation, a self-contained, idiot-proof email terminal.

Slightly larger than a paperback book and not much heavier, the MailStation looks like a word processor with a dialup connection — which is pretty much what it is. There are no messy configurations to deal with, as the unit comes preloaded with individualised passwords and dialup numbers provided by the Internet Service Provider (ISP). Plug in the power and phone line (and the optional printer), and you're away...

The catch? In the US, MailStation requires owners to use Cidco as the ISP. In addition to the US$99 per-unit price, you are also obligated to pay $9.95 per month for a year of ISP service, or pre-pay $100 for the whole year. By comparison, AOL and most other ISPs charge more than twice that for full Internet service, but of course that includes complete access to the Web.

The MailStation won't deal with email attachments or snappy-looking formatted text on the screen though, so you're restricted to quite a basic email service. Then again, there's no need to worry about downloading an email virus, or which font emphasis to use for the maximum impact.

They're at it again!

FIGHTING 'ROBOTS' — that celebrated abuse of technology in the name of entertainment - is growing in stature. US television is now promoting the debut "the ultimate destructive sport, BattleBots" - complete with crushing metal, flying sparks and razor sharp saws. Not bad for something that started out as an amusing sideline for a bunch of remote control and robotics enthusiasts. (Business Wire photo)

New chips will allow wristwatch cellphones

JAPAN'S MITSUBISHI ELECTRIC has announced the development of a new IC processing technology that will combine digital and analog technologies onto a single system chip, including logic and memory functions. The company predicted that ICs to be built around the technology will enable communications companies to make cellular telephones small enough to be packaged as a wristwatch.

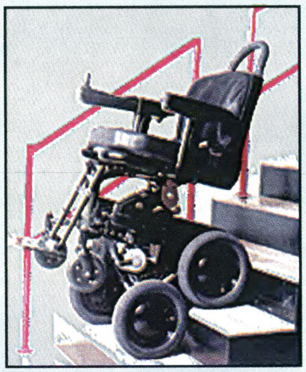
Mitsubishi said it hopes to introduce wrist-band cellphones as early as next spring. The company believes the units will be popular among younger consumers. Other products that could benefits from the single-chip circuits, in terms of shrinking the size and weight of the onboard electronics system, are digital cameras, televisions, cars, and household appliances.

Integrating analog and high-level digital circuits onto a single chips has proven difficult due to the electronic 'noise' created by the two different technologies. The signals easily interfere with each other's functions, causing system errors and crashes.

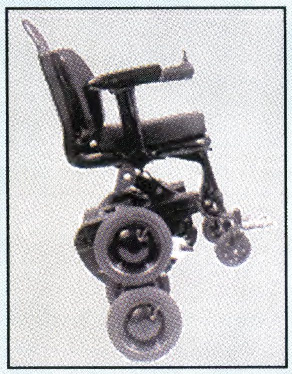
Mitsubishi said its latest process technology reduces the noise level enough for the system functions to operate normally.

Clever wheelchair

WITH wheelchair technology largely unchanged in 200 years, a new high-tech transport device is set to change that. The impressively-named 'Independence 3000 IBot Transporter' uses computers coupled to on-board sensors and gyroscopes to automatically adjust itself to changes in the terrain, and its user's center of gravity.



Thanks to this hi-tech approach, the IBot can roll smoothly on four wheels or two wheels. In the two-wheel position, the user can be raised to the same eye-level as he or she would be in when standing. When confronted with a task that demands a change in its current settings, the IBot uses its internal computer and sensors, plus the user's commands to take the correct action in an 'intelligent' way.



This built-in intelligence allows the IBot to perform actions such as rearranging its wheelbase itself into 'feet' so the user can negotiate previously prohibitive obstacles like stairs and high curbs, plus surfaces such as high grass, sand, rocks, or shag-pile carpet.

The IBot is expected to be available in January 2001. The user's only prohibitive obstacle then might be the US$25,000 price tag...

Wow!

GOING where no video game machine has ever gone before, shipments of Nintendo's portable GameBoy surpassed 100,000,000 in June this year.

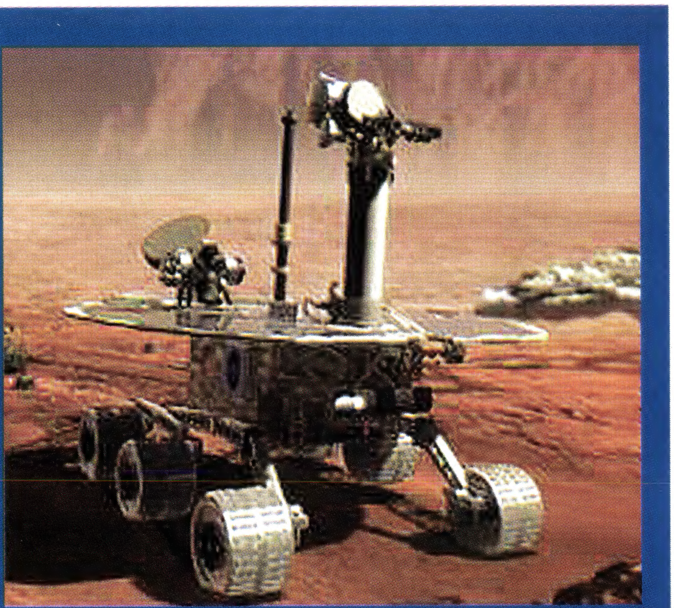
Since its worldwide launch in 1989, GameBoy has sold continuously at an average rate of more than 1,000 systems per hour for 11 years to reach that 100 million number.

Meanwhile, the Japanese version of PlayStation 2, which has been available there since March, has been getting luke-warm reviews by some who have played the system in the US. This may not be a positive leadup to the highly anticipated world-wide launch — scheduled for October in the US.

The hefty price tag, disappointing game play, and lack of software are reported as the main criticisms from gamers. Serious game freaks were so keen about the new PlayStation that went Japan to buy the unit, had it shipped over by friends living abroad, or bought it through online importers.

Industry observers have suggested that PlayStation 2 could have been a better product, but the company sacrificed quality to get the product into stores more quickly. The basic system initially sold for US$700, but has already dropped to $500 as sales have fallen off in response to 'customer disappointment'.

Nevertheless, Sony has shipped three million units to date, and has indicated that the worldwide (read: US) unit will be better. Molly Smith, a spokeswoman for Sony Corporation Entertainment America commented, "Although there is some crossover between the Japanese and U.S. content, it's not indicative of the U.S. launch and we hope to provide details at a later date."



Double rovers

NASA has announced that when returns to Mars in 2003, it will send two identical rovers on rockets launched less than two weeks apart. After two failed Mars missions, NASA had already announced that it would send a beefed-up rover down to the Martian surface cushioned by large airbags — this option was chosen over a plan to send an orbiter to study Mars from above, in 2003. Now the plan is to send two.

"This is a chance to not only double the science — maybe double the fun in the Mars program — but to do it for far less than twice the cost," said Scott Hubbard, Mars program director at NASA headquarters in Washington.

The cost for one rover (including launch vehicle) would be around $350 to $400 million according to Hubbard, but including a second rover would only add a further $200 million — cheap at twice the price...

The two-rover option also offers the redundancy to address some of the concerns raised after recent failures — the loss of the $125 million Mars Climate orbiter in September as well as the $165 million Mars Polar Lander in December.

World's smallest PC?

THE MATCHBOX PC (MPC) is reportedly the world's smallest PC capable of running common operating systems as Windows 95, Windows NT, and Linux.

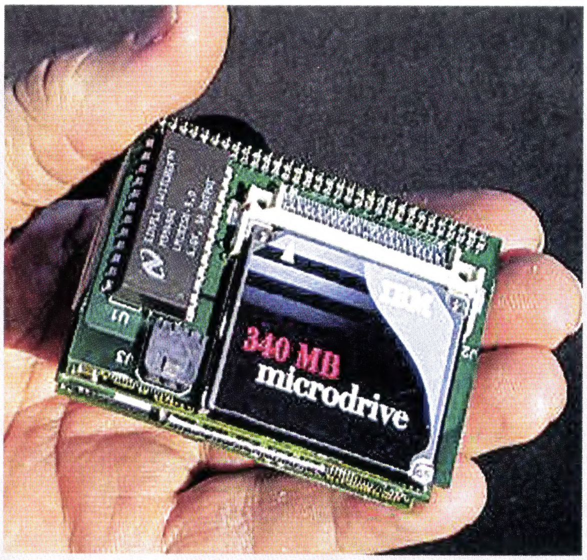
The main unit of the MPC is a motherboard, two JUMPtec modules (DIMM-PC and DIMM-IO), and a daughter board with a CompactFlash socket and power supply. The 'PC' measures just 70 x 50 x 24mm and weighs 93 grams. With the addition of a Li-Ion camcorder battery and port expander module it becomes a complete PC, having the same connectors found on desktop PCs 300 times as large, and capable of running the same programs.

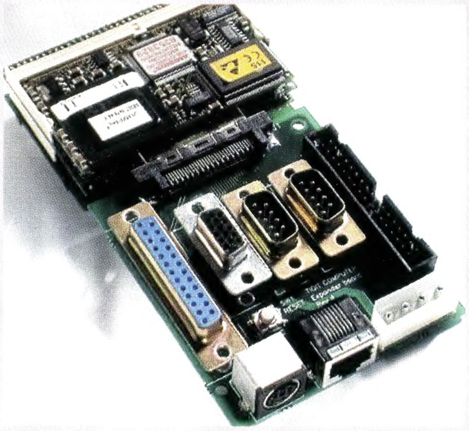
With a 66MHz (100MHz with heatsink) 486-SX CPU, the MPC features 16MB of SDRAM system memory, plus a 512k VRAM Cirrus video setup capable of SVGA (800x600) and XVGA (1024x768) resolution. Mass storage is via a removable 340MB IBM Microdrive, while standard 10BaseT, RS-232, parallel and floppy drive Ports are included. Power wise, it needs 6.5-40VDC unregulated at just 3-7.5 watts.

It's also internet-capable. In conjunction with the ethernet connection or an ordinary (or wireless) modem, the MPC can be used to browse any web site accessible from your desktop PC, in 8-bit color.

The Microdrive can be removed and replaced by a standard flash-RAM card via the standard CompactFlash socket. The socket operates in True IDE mode (as per the CompactFlash 2 standard), which permits any IDE device such as a 2.5" or 3.5" drive to be plugged in via a suitable adapter (not supplied). This permits a wide range of hard drives to be attached, from a 6GB 2.5" drive up to a 27GB 3.5" drive.

If you're heavily in to Wearable Computing, Mobile Datalogging, or even Space Missions (to name just a few), the MPC and it's I/O expansion card could be the answer to your development needs.





Robot removes woman's gall bladder

35-YEAR-OLD KIMBERLY Briggs has become the first American to have a gall bladder removed by a robot. The system, developed by da Vinci Surgical Systems, enabled a doctor to remotely perform the robot-assisted surgery by manipulating a pair of joy sticks and looking at a computer display.

The surgery was performed by Dr William E. Kelley Jr. "I was very pleased. I think it went very smoothly", said Kelley, who had been trained on the da Vinci but had previously only used it to operate on pigs and cadavers.

The da Vinci system uses wrist-like devices at the end of the robotic arms to give surgeons a full range of highly precise movements. Also adding to the benefits of using the robotic system is that the computer screen provides the surgeon with a highly magnified view of the area in which he is working. The images are provided by a series of tiny cameras that also enable the surgeon to get a 3-D view of the area.

The highly precise robotic instruments also vastly reduce the need to make large incisions in a body. In most cases, the opening required for a robot to perform the precision surgery can be covered up with a few Band-Aids, thus also reducing recovery time.

Surgery using the da Vinci has been approved only for abdominal operations in the United States, but the US$1 million robot is being more widely used in Europe.

Bacteria bullied into acting as transistors

RESEARCHERS at the State University of New York (SUNY) may have found a way to exploit a particular bacteria that's sabotaging the yield on semiconductor lines. The troublesome bacteria has been eluding even the harshest clean-room procedures by inducing the top semiconductor layer on chips to grow over them, thereby embedding themselves inside the chip.

"When we started this study, we were just trying to find the source of bacteria in the fab, and how they could remain alive after all the heroic measures to eradicate them with ultraviolet light, ozone and everything else including a dollar a gallon to purify the water," said Baier, who is director of the Center for Biosurfaces at SUNY.

The researchers recently realised that the bacterium's photosensitivity could be harnessed to create an optoelectronic switching element, ultimately creating a 'biotransistor' — a single-electron photonic device that converts light into electricity. We may well see 'bio' cat's whisker diodes demonstrated in the near future, unless perhaps an ethics dilemma rears its head...

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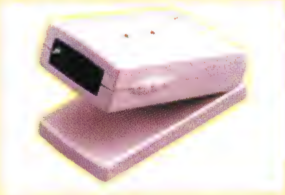

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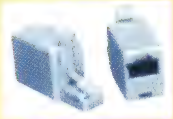

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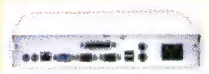

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Letters to the Editor

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory. All contributions to EA will be considered for publication in this column.

XIUM — from the museum?

Tom Moffat's story (July '00) about the XIUM has struck a chord with me. If the XIUM is indeed "a short coil of rolled up hookup wire", then it may not be a new idea at all.

Back in the late 1940s, such a coil was offered as an antenna option on small 4- or 5-valve radios. Quite apart from the diabolical 'mains aerial', there was a little bizzo on some AWA sets, which was connected to the aerial terminal, and could only be a coil of wire.

How well does it work?

Quite well. The performance is about mid-way between the standard 2-metre 'throw-out' aerial, and your finger. And much better than no external aerial.

I imagine the intention was for radios where an external aerial wasn't practical. So, I think that the XIUM idea is and isn't sound. It works OK for MW AM signals, but Tom tells us that it is rather poor for wideband VHF. No surprise, really.

Tom says he was 'taken in', and I think he is being somewhat hard on himself there. The man who designs the 'Miracle AM Antenna' does know his RF theory, and had a reasonable expectation that the XIUM might have worked. If only Tom had hooked it up to his SW rig, he just may have got a pleasant surprise...

Bruce Moyle,
Carnegie, Vic.

Relevant and refreshing

I would like to congratulate you on your magazine. I find it to be informative and refreshing in style. The range of articles is interesting, and relevant.

I particularly liked the recent article on Gameboy programming, and Computer Clinic; computer interface projects are always welcome.

Simon Scates
(via email)

Ever changing EA

Like many of your readers I started buying Radio & Hobbies when quite young (around 1948) and have avidly followed the magazine through its various changes ever since. I am disappointed to read a number of Letters in EA over the last few months decrying the 'new' appearance and content of the magazine.

Generally, the authors appear to be either electronic enthusiasts and/or professionals of long standing and as such supposedly have the intelligence to have kept up with the tremendous technological changes that have occurred in all aspects of electronics over the years. But apparently they cannot recognise the relatively simple but important reasons behind the need for the changes that have occurred with EA, although the content itself seems little changed.

I trust that the great majority of satisfied EA readers, who, like myself, are comfortable with the new format, feel a little compassion for these unfortunate detractors who threaten to cut off their noses to spite their face!

M Anderson
Batemans Bay

Battery manager mods

I don't know how interested you are in this information I found whilst constructing and using the Battery Management kit designed by Oatley Electronics. As you had not actually published the circuit design but only reviewed the kit construction and use.

After construction of mine, I found the duty cycle for the LED display to be incorrect, as the LEDS where on more than off, i.e. the m/s was reversed, I traced this to the PC board overlay for R16 & R17 being swapped.

Also if the automatic version is built (as I did), I found that the device had so small a hysteresis around the cut-out that it caused the load to be switched on/off at a rapid rate as the current drawn dropped the voltage below threshold and above.

My fix for this was to build the kit as per automatic settings, i.e. the links placed in but to add another small transistor across the reset switch, emitter to earth, and collector to R10 pull-up. The base was linked via a 10k resistor to a suitable cut in voltage (I chose 11.8V) from one of the comparator outputs (IC2/IC3).

This then gave the alarm at 11V, cutout at 10.6V and automatic reset at 11.8V, plen-

It's as simple as ADC...

I was reading the Experimenting with Electronics section in EA May 2000 and noticed an error in the explanation of the '4-bit ADC'. The article reads " If you read up more on the theory of ADCs, you'll discover that the maximum frequency this circuit will handle is half the clock frequency - this is all part of the Nyquist theorem..."

The maximum frequency an ADC can handle is half the rate of analogue to digital conversion. In this circuit, the worst-case analogue to digital conversion time is 16 times the clock frequency. This can be seen if the input voltage swings from one extreme to the other, in this case from 0 to 8 volts. For example if the input is zero volts and output is 0000, then the input changes to 8 volts the counter will count up for 16 clock cycles until the output is 1111. If then the input goes to zero volts, the counter will count down to 0000 for 16 clock cycles. Therefore the maximum frequency that this analogue to digital converter can handle is 1/32 the clock frequency.

This then affects the following statement, further down in the article, where it talks about an ADC for voice "i.e. if the clock runs at 20kHz, set the audio filter frequency to 2.5kHz." The maximum frequency the ADC can handle with 20kHz is 625Hz, which is the lower end of the voice spectrum. For the ADC to work with voice it will need a clock frequency of 96kHz minimum (3kHz voice). For the design suggested in the article, which is more realistic, the clock frequency will be 320kHz.

Daniel Beyer
Electrical Engineer
John Tonkin Water Centre

ty of hysteresis to allow for voltage drop in wiring due load current. Now it works great.

The extra switch allows automatic reset to operate or the manager to remain tripped until the user presses the reset. Even in the new automatic mode, manual reset can still be done before the selected reset voltage provided the battery voltage is above 10.6V.

Brian Mullin
(via email)

Happy winner - 1

I have been subscribing to EA since 1976, and have kept all my copies of the magazine.

I am employed as an electrician, and, over the years have received considerable help and enjoyment through the responsible technical journalism that is EA.

It was a great surprise to arrive home one day and find that I had won one of the HP power supplies. Thank you so much — I will be able to give it all the work it deserves.

M. Fletcher
Chermside West, QLD

Happy winner - 2

After renewing my subscription and never having won anything of real value, imagine my surprise when I was told that I was one of the winners of power supply from Agilent Technologies. I must thank Agilent and EA for this prize.

I have read and enjoyed your magazine for over 20 years. As a photographer back in the 60s, I was involved with EMI (Aust) in Sydney, in setting up a photo session for their research laboratories and ventured into the unknown waters (for me) in making printed circuit boards. (i.e. Xerox, photoresist and silk screen processes.) It was a steep learning curve.

Larry Larson was chief Engineer for the laboratory at the time, and I recall reading an article written by him in EA during the late 80s concerning the demise of his business with the lack of financial support for research and development in the industry at that time. Has much changed?

With no more of my fingerprints etched on the pages, the improvements in paper quality and binding of EA has added to an already very good magazine. Thanks again,

Michael Whitestone
Scullen, ACT

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Watch the Olympics in Big Screen

If you can't get to the Olympics in person, the next best thing will be watching them on a big-screen TV. But there are a variety of big-screen sets available, offering different ways to achieve 'big screen' video images. How do you pick the best one for your needs? Here's a guide...

By Jim Rowe

THERE'S NO DOUBT that watching the Sydney 2000 Olympic events on TV will have a lot more impact if you're able to see them on a relatively big screen. It's generally easier to follow the action on a big screen, too.

But just how big do you need to go? Is it a simple case of 'the bigger the better', or are there other things to bear in mind?

There are quite a few different types of big-screen TV, too: sets with a large conventional picture tube, larger sets again using a rear-projection system, video projectors and also big flat-panel screens based on plasma technology. Each of these display technologies has its own strengths and benefits, along with its drawbacks; picking the right one for *you* can be tricky, especially if you're not up to speed on the various pros and cons.

That's the aim of this article: to give you a good basic idea of the technologies currently available for displaying large TV images, and their comparative strengths and weaknesses. Armed with this information, you'll hopefully be able to see the 'big picture' more clearly, and be in a much better position to choose the right technology and set for your own particular needs.

So let's begin. First of all, is bigger always better – both in general, and especially when you're watching sporting events like the Olympics?

Yes, it *is* more or less true, within reason. Just as watching virtually any movie on a big cinema screen gives it much more impact that on an old 17" TV, watching a sporting event on as big a screen as possible will have maximum impact too. The larger image occupies more of your field of view, and not only involves you more but also lets you see and absorb more of the details. In fact it can be more involving than sitting way up in the grandstand in row 73H, and a darn site cheaper!

That said, though, there's also a limit to just how large the screen should be – especially in this era of good old 'standard definition' analog PAL television, the kind we've all been watching in Australia for decades. The kind where each picture is made up from 625 horizontal lines, and there are 50 of them transmitted each second.

The fact is that when you're viewing this sort of TV image on a 68cm (27") or smaller screen at a typical viewing distance of two metres or so, you're generally not aware of the 'flicker' produced by the way its pictures are presented at the 50-per-second rate. It looks quite smooth and flicker free.

Style!

Olympic photo by John Marmaris – courtesy of AMP, *Olympic Torch Relay* partner

***A big screen** for the Olympics? Why not? Fujitsu's PDS4214 42" plasma screen certainly looks the part, and it doesn't take over the livingroom either.*

But once you enlarge that image to occupy more of your field of view, there comes a point where the individual lines do become visible to your eye. And the sides of the image reach the part of your eye's retinas that are more sensitive to the 50Hz flicker, so you become more aware of this too.

These effects happen regardless of the technology you're using. Simply blowing up this kind of TV image tends to make its line structure and flicker more visible – along with any other imperfections that may be present.

It's for this reason that some of the better large-screen sets and projectors incorporate special features like digital scan conversion 'line doubling' (giving you a synthetic high-resolution picture, with twice as many lines spaced more closely together); 'spot wobble' (scanning the lines in a fine vertical 'zig-zag' fashion, so they thicken to make the gaps between them less visible); 100Hz scanning (twice as many pictures per second, to reduce flicker); video 'comb filtering' to reduce interference between the high-frequency picture details and the colour information (like 'dancing purple

At far right is Fujitsu's Plasmavision PDS4221E-S, with built-in speakers, while the shot above shows how unobtrusive a plasma screen can be.

Below, we have a full surround sound system from Sony, with the centre of attention being the big screen and multi-channel receiver.

snakes' in fine check patterns, etc.); beam-velocity modulation to improve video sharpness, and so on. The larger the picture gets the more worthwhile these high-tech enhancements become.

So by all means go for the biggest-screen set that your budget and loungeroom allow. But at the same time try to get a model with as many of these 'picture enhancement' frills as possible; they certainly do improve the perceived picture quality and impact.

Now let's look at the various display technologies that you'll find in today's large-screen TV sets, starting with the one that most of us are most familiar with: the good old cathode-ray tube or 'CRT', as still used in the majority of TV sets and computer monitors.

Big-screen CRTs

The directly-viewed CRT has been used for displaying TV and video images for well over 50 years, and is the main example of 'valve technology' that's still being used in most of today's homes and offices. In fact it's essentially three valves in one -- one for each of the three primary colours used to recreate a colour TV picture.

The CRT needs high voltage (typically at least 25,000 volts) and consumes a fair bit of power, but it's well-proven technology and still very hard to beat when you're considering picture brightness and clarity. After the tube is setup correctly during manufacture, it generally keeps on producing high quality images for many years with little or no further adjustment.

A CRT also tends to be the most cost-effective display technology – that's why they're still used in the majority of TV sets and desktop computer monitors.

Of course there's a practical limit to the size you can make a CRT. It's still essentially a glass 'bottle' containing a deep vacuum, which means that the flat or near-flat screen in particular has to be made very strong to withstand the huge difference in pressure between the atmosphere outside, and the vacuum inside. The bigger and flatter the screen, the thicker (and heavier) the glass must be made. As the screen gets larger the high voltage supply must also be made huskier, to deliver enough electrons to maintain the image brightness.

As a result, it's not really practical to make CRTs with screens larger than about 80-86cm (about 34"). By this size, the weight of the picture tube alone has become quite daunting.

A further drawback of CRTs is that because of the way they work, 'spraying' electron beams in zig-zag fashion to form the picture, it's hard for them to achieve an image that's completely undistorted in terms of *geometry* (i.e., achieving truly circular circles, etc.), and uniformity of brightness and focus right into the corners.

Still, if your TV viewing is in a relatively small room and a picture measuring 68 - 80cm on the diagonal is large enough to give you a wide field of view, a standard 'big screen' TV set with a directly viewed CRT really is hard to beat. You'll get clear, very bright pictures, and at a cost that's significantly lower than virtually any of the other approaches. Even the top-line CRT based 80 - 86cm sets are generally below $4500, with some 68cm models available for less than $1200.

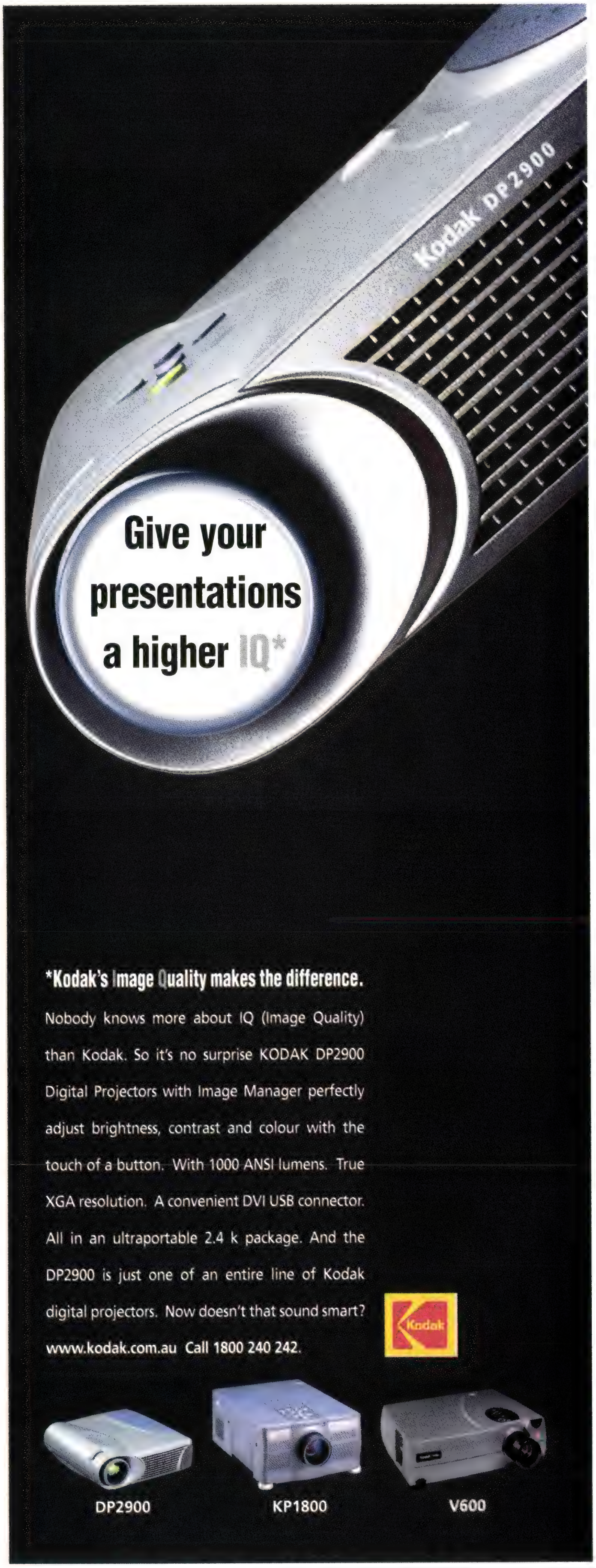
But what if your TV viewing room is fairly large, and you want the whole family to be able to watch the Olympics – so you'd really like a picture somewhat larger than 86cm? Well, now you need to consider one of the alternative technologies, so we'll look at these in turn.

Rear-projection sets

In many ways the next step up from a directly-viewed CRT set is a rear-projection TV. You'll have seen these at the larger department stores and audio-visual dealers; they're considerably taller and more rectangular than conventional TV sets, with a completely flat glass or plastic screen filling the upper 2/3 or so of the front. The screen generally has corners that are 'square' rather than rounded, and some of them offer a 'widescreen' aspect ratio of 16x9 or so rather than the familiar 4x3.

As the name suggests, this type of set creates the larger image by means of an optical rear projection system inside the cabinet. Generally the image is still created on a CRT, or perhaps three of them – one for each colour. Either way, the CRT(s) may be relatively small (about 18cm, or 7"), but run from very high voltage (typically 32kV) so that it/they produce *very* bright images. Sometimes they're water cooled, to prevent overheating. A system of wide-aperture lenses and very efficient mirrors is used to project these very bright small images onto the rear of the translucent main screen. Often the screen itself has a flat-profile 'Fresnel' lens of fine circular grooves moulded into its rear surface, to give more even illumination and stop the picture from having a 'hot spot' in the centre.

The basic image clarity achieved by this type of set is essentially still very close to that of a directly-viewed CRT set, although the 'folded' optical projection system does give a small reduction



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***One nice thing** about plasma screens is that they don't take up much space – you can just hang them on the wall...*

in image sharpness and introduce some additional distortion. But the main penalty is image brightness – when you optically magnify an image this way, its brightness inevitably drops, in a roughly square-law manner (i.e., doubling the diagonal size gives about one-quarter the brightness).

There's also an additional problem with rear-projection sets in terms of screen efficiency and reflection of ambient light. Not all of the light projected onto the rear of the screen reaches the front, while conversely some of the ambient light falling on the front tends to be reflected back into your eyes. So as well as reduced brightness, the picture *contrast ratio* tends to suffer if there's much ambient light level. In particular, the black part of the picture lightens to become only a dark grey.

So rear-projection sets tend to give the best picture in a darkened room, or one with at least subdued lighting. Of course that may not be a problem if you like watching your TV in the dark...

IF YOU NEED A PICTURE LARGER THAN A REAR PROJECTION SET, YOU'LL

Another possible disadvantage of rear-projection sets is that for some people, they tend to be a bit large and overpowering as a piece of furniture – especially in medium-sized rooms. Still, what's 'large and overpowering' for one person may well be 'big and impressive' to somebody else, so it's largely a matter of taste.

On the plus side, rear-projection sets are much the same as direct-view CRT sets when it comes to hassle-free viewing. There's still virtually nothing to set up; you simply turn them on and away they go.

As you'd expect, though, the price is generally higher than for traditional direct-viewing CRT sets. Currently you can get a good 103cm (41") rear-projection set for about $4100 retail, while one with the largest 154cm (61") screen size will typically set you back between $9000 and $11,000.

Video projectors

Needless to say, there's again a limit to the size you can make a rear-projection TV – before the cabinet simply becomes too large and overpowering, and impossible to get into a typical room without pulling it apart and reassembling it again. So if you need an even

***Below** is Löwe's big CRT screen, with built-in stand for your VCR, DVD and amplifiers.*

larger picture than the 154cm or so of the biggest rear-projection set, you'll generally need to consider a video front projector.

Front projectors (usually just called video projectors) basically work in much the same way as traditional slide and movie film projectors, projecting their image onto a screen from the 'front' (i.e., the same side of the screen as the viewers). They're generally a small to medium-sized box that either sits on (or sometimes under) a coffee table in the centre of the room or hangs from the ceiling, and projects a large picture on a fairly standard matt white screen on (or near) the far wall.

There are actually a number of different technologies used in video projectors, each with its own strengths and weaknesses. We'll take a quick look at each one in turn, so you can put them into perspective.

Three-tube projectors

The first technology that was used for video projectors is the three-tube system, where three small CRTs (for the three primary colours) are mounted side by side in the box with their screens facing the main screen via colour filters and matching large lenses.

This type of projector is still fairly popular in clubs and pubs, and you can always recognise them by their three large lens 'eyes', glowing red/green/blue and facing the screen.

GENERALLY NEED TO CONSIDER A VIDEO FRONT PROJECTOR

Essentially this is much the same technology used in rear-projection sets, except that the optical projection path is now 'unfolded' and there are no screen transmission losses (unless your room is filled with smoke!). So as the picture is still being produced by CRTs, and there's a more efficient optical system, we now have the potential for excellent image brightness and quality.

On the other hand, because the projector and screen are now separate, we've also lost the advantages of a fixed optical setup. Before you can achieve the full image quality and start viewing, this kind of projector has to be carefully set up so that all three optical paths are accurately focussed on the screen, and with the three colour images precisely 'converged' together to form a single clear colour picture. This can take a fair bit of fiddling around, so three-tube projectors are really only suitable for fixed 'permanent' installations – where you set them up, and then don't change anything.

Apart from that, the only other shortcoming of this type of projector is that their image brightness often isn't spectacular, even with the tubes fed with very high voltage and with fluid-cooled tubes and lenses. Typically it's between about 250 and 1000 lumens. As a result, three-tube projectors generally give the best results in a darkened room, especially when you're going for a *large* picture (say over about 2m diagonally).

That said, though, three-tube projectors probably still give the clearest and most satisfying viewing once you want a picture larger than is available from a rear-projection set. But be prepared for their considerably higher price (usually well over $15,000), and for the setup hassles.

CAN YOU RECEIVE IT?

Projectors are certainly impressive beasts; nothing else will give you such a big picture from such a tiny box. But no matter what technology projectors use — three-CRT, LCD or DLP, they are generally just big-picture display devices. Unlike standard CRT and rear-projection sets, they're not a complete TV set because they don't have a built-in receiver for the TV channels.

This means that if you want to use this kind of projector as a way of watching the Olympics, you'll need to feed it with 'off air' video signals from a suitable source. In most cases the easiest way to do this will be to use the receiver in your VCR, using its direct video (or preferably S-video) output to feed the projector.

***This is** the sort of thing you can expect to see in the line of rear-projection sets – a big 51" screen from Panasonic's TX51P15H.*

Glossary

4:3 Aspect ratio of the PAL and NTSC TV screen, with the '4' unit width corresponding to '3' unit height, proportionally, regardless of the actual size of the screen.

16:9 Aspect ratio of widescreen DTV formats for all HDTV and some SDTV (Standard Definition) video. The '16' unit width corresponds to a '9' unit height, proportionally, regardless of the actual size of the screen.

AC-3 See Dolby Digital

Aspect Ratio The ratio of a television picture width to height. In PAL and NTSC video, the standard is 4:3. In HDTV and SDTV widescreen video, it is 16:9.

Closed Captioning A text stream included in the broadcast signal that provides narrative description of dialogue, action, sounds, and other elements of the picture. Most often used by the hearing impaired and in environments where audio is undesirable (such as in restaurants).

CRT (Cathode Ray Tube). A display where a high-voltage electron stream is scanned across a phosphor-coted screen. Used in just about all TV screens and computer monitors.

DLP (Digital Light Processing) ICs with arrays of thousands of microscopic hinged mirrors that reflect light in response to digitised video information.

Dolby Digital (formerly Dolby AC-3) The approved 5.1 channel (surround-sound) audio standard using approximately 13:1 compression. Six discreet audio channels are used: Left, Center, Right, Left Rear (or side), Right Rear (or side), and a subwoofer (or LFE, for 'Low Frequency Effects) considered the ".1" as it is limited in bandwidth.

Dolby Surround (Dolby Stereo): Matrix analog coding of four audio channels - Left, Center, Right, Surround (LCRS) — into two channels referred to as Right-total and Left-total. The Dolby Surround system originally was developed for motion pictures.

The three *coloured eyes are a dead give-away – It's a three-tube projector. Found in pubs and clubs, it takes a bit of setting up, but gives a bright display.*

At far right *is one of the best personal projectors you can buy – NEC's LT84 uses DLP Micromirrors to give a bright and clean display but at a price...*

Below *is Fujitsu's LPF4700 – an LCD projector with a brightness of 780 lumens.*

LCD projectors

The next video projector technology to be developed was the LCD (liquid-crystal display) type, and this is nowadays the most popular kind of projector you'll see on offer. They're much more compact than the three-tube type, and have a single main lens rather than three.

There are actually two different types of LCD projector, one which uses three LCD panels (one per primary colour) and the other a single LCD panel with striped colour filters. However while the latter approach is simpler and generally less costly, it also tends to deliver somewhat poorer images. As a result most LCD projectors currently available use the three-panel system, so we'll concentrate on that type.

PLASMA PANELS ARE GENERALLY QUITE THIN -- OFTEN NO MORE THAN

Inside, there's a high intensity lamp and a precision optical system that first filters and splits the lamp's output into the three primary colours. Then each colour beam is passed through its own LCD panel – roughly the same size as a 35mm colour slide, but with its image varying with the video signals. The three beams are then recombined via a precision optical prism block, and the resulting colour image passed through the main projection lens to focus on your screen.

The main advantage of this kind of projector are that they tend to have a high light output (usually well over 500 lumens, and up to 10 or 12 times that figure), and are able to produce very bright images. So they're good for producing images of 2.5m (diagonal) or more, even in typical ambient room lighting. Setup is also quite fast and straightforward, especially if the projector is fitted with a zoom lens; all that's required is zooming the image size to match your screen, and then setting the focus for best image clarity.

There is a penalty to be paid for this enhanced light output, though. Because an LCD panel is essentially an X-Y array of individual pixels, they're really better suited to projecting graphic images from a computer than handling video material. When the projector is displaying video, its internal processing circuitry has to convert the incoming video information into the corresponding array of discrete 'samples', each corresponding to a pixel dot in the LCD panel array.

A further complication is that the 'active' pixels in an LCD panel array tend to be separated by small dark lines (basically needed to make the connections to each row and column). As a result, an LCD image tends to have a 'dot structure' of its own (i.e., quite separate from the TV line structure), that's clearly visible when it's enlarged to full-screen size. Paradoxically this dot pattern tends to be more evident in LCDs offering high image resolution than those offering lower resolution, too.

It's not just a matter of being 'aware of the pixel dots', either. The LCD dot arrays tend to produce 'jaggy' edges on sloping lines in the image, which can be especially visible on fine detail. And when there's movement in the picture, as there usually is when you're watching sports, the dot array also tends to cause its own variations in brightness – as the picture details 'move over the cracks' between pixels.

So even when their basic digital resolution is nominally more than sufficient to handle high-quality video (i.e., SVGA or better), the image produced by even the best LCD projectors still tends to be a *little* less satisfying than a CRT-based display device. Brighter, to be sure, but not quite as clear.

Another small drawback is that one way and another, there tends to be quite a lot of heat dissipated inside an LCD projector. As a result they're usually fitted with one or more cooling fans, and there can be quite a bit of fan noise...

Still another shortcoming is that on the whole, LCD panels are not super fast in reacting to rapid changes in signal level. This tends to cause a small amount of 'smear' on fast-moving images, although with top-quality projectors the effect is almost impossible to detect.

On the plus side, the pixellised X-Y array nature of an LCD projector's picture means that it's essentially perfect in terms of image geometry – circles remain circles, sloping lines remain straight and pixel clarity is essentially constant even into the corners.

On the whole, LCD projectors offer a very convenient way to produce big and bright pictures, even in rooms with typical indoor lighting levels. Their small physical size can also be very appealing, allowing them

to be 'put away in the cupboard' when they're not being used. Prices currently range from about $6000 to $15,000, depending on light output, image resolution and things like motorised or manual control of lens zooming and focussing.

DLP projectors

The latest type of video projector technology to evolve is that based on the Digital Light Processing or 'DLP' system developed by Texas Instruments. Instead of the LCD panels used in an LCD projector, this type uses either one or three tiny chips with X-Y arrays of thousands of microscopic mirrors, with each mirror hinged and able to move in response to the digitised video information. Needless to say the mirror arrays are essentially 'dynamic reflectors' rather than 'dynamic slides', so the optical system inside the projector is rearranged to suit.

DLP projectors are still quite new, and a full appreciation of their advantages and drawbacks is yet to emerge. However one advantage seems to be a higher optical efficiency that LCD projectors, translating into either brighter pictures or less heat (and fan noise), or both. That's because a micromirror array chip wastes less energy than an LCD panel. The tiny mirrors are also faster to react than LCD pixels, giving less smear.

100MM DEEP. MAKING THEM GREAT FOR HANGING ON THE WALL

Although the DLP micromirror arrays still involve conversion of the incoming video signals into discrete pixel samples, the 'image pixellation' effect is somewhat less apparent than with LCD projectors. That's because DLP array chips can be made with the tiny mirrors almost touching, so there's virtually no 'dark lines' between them. And because the image is an X-Y pixel array, like that of an LCD projector, picture geometry is again excellent.

As yet, most of the DLP projectors that have been produced seem to be high output (like 5000 - 6000 lumen) three-chip models for use in clubs, auditoriums and theatres, and with prices starting at about $20,000. However smaller single-chip models have started to appear, like the NEC LT84, which offers an output of 700 lumens and excellent picture quality for around $10,000.

Plasma panels

The remaining type of 'big picture' display devices we should look at are plasma panels. In their large full-colour form these have only been developed in the last couple of years, and they're easily recognised because they are generally quite thin – often no more than about 100mm deep. This makes them great for 'hanging on the wall', or suspending them just in front of one.

Essentially a plasma panel is a huge array of tiny gas-discharge cells (like tiny fluorescent tubes), with phosphors which glow brightly in one of the three primary colours and with columns of the different colour cells repeating cyclically over the screen – a bit like the phosphor stripes on a CRT screen. However instead of being scanned by electron beams, the cells are driven by an X-Y addressing system like that in an LCD or DLP projector panel. This means that for displaying video the incoming signals must again be converted into discrete pixel samples, but the discharge cells are very closely spaced and there are virtually no 'dark lines' between them.

The end result is a particularly bright, clear picture, which generally looks very impressive even in a brightly lit room. There are generally almost no 'pixellation' artifacts, and the picture geometry is again essentially perfect. They're like combining the image quality of a CRT with the linearity of an LCD or DLP...

At this stage, though, plasma panels are only available in picture sizes up to about 127cm (50"). They're also very expensive, with 100cm (40") models typically costing around $17,000 and 127cm models between $19,000 and $30,000. This means they're of great interest to corporate users for boardroom and sales presentations, but probably well beyond most of us, when it comes to our home viewing budgets!

(Continued on page 97)

AT A GLANCE

- Big screens are impressive, but there are a number of technologies out there that you should be familiar with if you are looking to buy.
- Each type of display has it's own advantages — and disadvantages Be sure to see it in action before you buy.
- Generally, a standard large-screen CRT is the best (and perhaps cheapest) way to get a big screen in your home.
- The bigger the set, the more important the extra features. Check out things like line doubling and 100Hz scanning on your big screen — they all help give you a better picture.

Glossary

DVD Digital Versatile Disk. (Formerly Digital Video Disk.) Same size as a CD but stores seven times CD capacity on a single side. Most DVDs are used to display full-length commercial motion pictures, plus additional material such as outtakes, etc.

Fresnel A flat lens made up of fine circular grooves, used to diffuse light evenly.

LCD (Liquid Crystal Display). A screen made up of a thin layer of liquid sandwiched between two layers of glass. Individual pixels within the panel can be turned on or off to filter light passing through the display.

Letterbox Image of a wide-screen picture on a standard 4:3 aspect ratio television screen, typically with black bars above and below. Used to maintain the original aspect ratio of the original source (usually a theatrical motion picture of 16X9 aspect ratio or wider).

NTSC (National Television Systems Committee). The standard television system used in the USA, which is incompatible with Australian PAL-only receivers.

PAL (Phase Alternation, Line). The standard colour television system used in Australia, as opposed to NTSC, the format used in the USA

PIP (Picture In Picture). The ability to display two screens at once, one inside the other. Often used to keep an eye on one channel while watching another.

Set-top box (STB) Device that converts and displays data from analog cable, digital cable, or digital broadcast television for display on a standard analog television set, or a box that receives off-air DTV signal for display on a DTV monitor.

Widescreen Term given to picture displays with a wider aspect ratio than 4:3. Digital HDTV is 16:9 widescreen. Most motion pictures also have a widescreen aspect ratio, some even wider than 16:9.

A new addition to Pioneer's range of home theatre products is a complete system integrating a DVD/CD player with a six channel amplifier and subwoofer/satellites speaker setup. Dubbed the HTZ-7 'Vision Plus', the system also sports a separate display panel and virtually all control via a touch-screen LCD remote. **By Jim Rowe**

Pioneer's Vision Plus

DECADES AGO, JAPAN'S Pioneer Electronics established a reputation for producing well made audio products which delivered above-average performance, yet were very competitively priced. The reputation was not only well earned but continued to grow over the years, as new generations of products were developed and released.

However it appears that recently, company management decided that this image of Pioneer might have become a tad stodgy. So as well as scrapping the well-recognised Pioneer logo with its omega (Ω) and tuning fork symbol and replacing it with a more streamlined logo in 'rounded italics', they also decided to develop a range of more innovative ('pioneering') products, to revamp and enhance the Pioneer image as a whole.

We've already reviewed a couple of these 'new Pioneer' products in *EA* last year: the HTV-1 'Simple Solution' surround sound system (July 1999) and the IS-21MD Shelf System with MiniDisc recorder (November 1999).

This month we're going to look at their latest addition, which is an 'all-in-one' home theatre surround sound system integrating a high quality DVD/CD player with a six-channel Dolby Digital amplifier and matching speakers. Called the HTZ-7 'Vision Plus', it gives you virtually everything you'd need for a very satisfying home theatre system, apart from the large-screen TV set or projector.

It also boasts a display panel which is separate from both the DVD player and the subwoofer/amplifier module, and a 'super remote control' with touch-screen LCD, which is effectively used to control the entire system. So in many ways the HTZ-7 is pretty close in concept to the Bose Lifestyle 50 system I reviewed last month — except that as an added bonus Pioneer gives you the capability of playing DVDs as well as CDs.

The HTZ-7 is also not nearly as expensive as the Bose system, although it's still rather more pricey than we've come to expect from Pioneer in the past. Which suggests that their image is perhaps changing in more ways than one...

But let's look at the details. At the heart of the HTZ-7 system is the HTZ-C7 'Centre Unit', which contains not only the DVD/CD player but also the system's AV control preamp and AM/FM stereo radio tuners. In short, it's an integrated combination of the DVD player and the 'front end' of the surround sound system — and all in a case smaller than most stand-alone DVD or CD players. Measuring only 320 x 274 x 89mm, it's solidly but elegantly made with a top and front panel from 2mm-thick brushed aluminium extrusion.

The DVD player uses the Viterbi RF decoding process, claimed as a Pioneer exclusive, which is said to improve DVD playback by reducing data errors due to fingerprints, dust and warped discs. The player also offers a 10-bit video DAC and twin 96kHz 24-bit audio DACs, for good audio resolution.

Of course in the same box there's the integrated control preamp and radio tuner, as revealed by the input/output connectors at the rear. Here you find terminals for an AM loop antenna (supplied), a socket for an FM antenna (also supplied), and inputs for two further AV sources (Video1 and Video2, typically a Laserdisc player and a VCR), two audio sources (Audio1 and Audio2, typically an MD player/recorder and a tape deck). Stereo analog audio inputs are provided for all four of these external inputs, but the two video sources can alternatively be configured for digital bitstream input. The Video1 source can only use the coaxial S/P-DIF input, while the Video2 source can only use the optical TOSlink input.

There's also a TOSlink output, by the way, so an optical feed can be directed to the digital input of an MD or CD recorder if you wish. Quite separately there are analog stereo audio outputs to feed to an audio cassette recorder, as well.

To drive your TV or video projector, the HTZ-C7 provides both composite and S-video outputs — but no component video (Y/Cr/Cb) outputs. There are composite and S-video inputs for both Video1 and Video2 AV inputs as well, so the video from these can be switched and directed to your video display automatically when their audio is selected.

Like many of the better DVD players the unit is compatible with both NTSC and PAL video, and has a three-position TV System switch on the back. For those with a PAL-only receiver it can convert NTSC video into modified PAL (PAL60), for compatible viewing.

Other features of the DVD player include all of the usual programmability in terms of picture aspect ratio, contrast mode, language and subtitle selection, digital sound output format, a 'midnight' mode for reduced audio dynamic range, choice of surround sound mode and so on.

So that's what is inside the HTZ-C7, at least in a functional sense. You'll notice that I haven't mentioned any display, because there isn't any; that's separate, as I'll mention shortly. All you find on the C7's front panel apart from the DVD player's tray are some basic 'manual override' control buttons — four for the overall system (Power/Standby, Tuner select and Volume Up/Down), and five for the player itself (Open/Close, Forward and Back, Play/Pause and Stop).

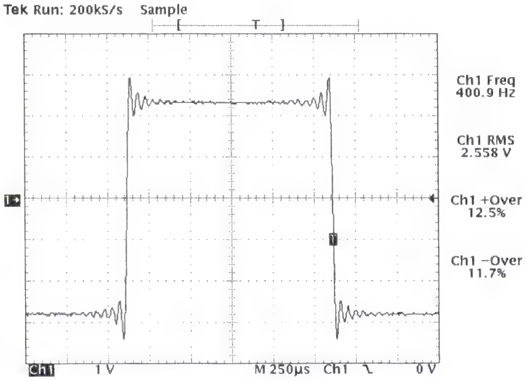
The HTZ-C7 also doesn't seem to include the Dolby Digital surround sound decoding. That's apparently built into the other main box in the HTZ-7 system, the HTZ-SW7 Powered Subwoofer module. Which despite its name isn't just a powered subwoofer but also contains the power amps for the five satellite speakers, plus the Dolby Digital decoder (with Pro-Logic built in) as well.

The HTZ-SW7 is linked to the HTZ-C7 via two cables; one fitted with 10-way mini connectors and presumably carrying analog audio and control signals, and the other fitted with RCA connectors and labelled 'Digital Audio'. Presumably the Dolby Digital or LPCM audio from either the internal DVD player or the external bitstream sources is fed down to the decoder via this cable.

By the way, the HTZ-7 system will only decode Dolby Digital and LPCM digital sound. It doesn't handle DTS or MPEG2 encoding, although you could prosumably drive an outboard decoder via the digital audio output.

Also plugging into the rear of the HTZ-SW7 is another cable with 10-way mini connectors, this time connecting to the system's separate display unit mentioned earlier. The display unit measures a compact 210 x 86 x 62mm, and is neatly styled with a smoked-plastic front.

Although 'detached' it seems to have a fairly standard fluorescent panel, with track and timing information in large white characters and many status indications in other colours. The surround sound mode and surround channel configuration icons are in red, for example.



Upper right: *The audio square wave response of the DVD/CD player, taken from the Tape outputs. It's better than average in terms of overshoot and ringing.*

The basic idea of this roving display unit is that while you can place it on top of the DVD Centre Unit if you wish, it can alternatively be placed up to about 3m or so away from the subwoofer unit, if that's more convenient. Which is a very nice feature, especially as the display unit also contains the IR sensor for the all-important remote control.

Inside the HTZ-SW7's sturdy 482 x 445 x 240mm box there's a 200mm woofer in a bass reflex enclosure, driven by a 50W power amp, which handles all of the system's bass up to about 250Hz. There are also five separate amplifiers of 30W rating, which drive the system's satellite speakers.

The satellites are all identical and in very compact ABS boxes, measuring 150 x 90 x 70mm and containing a 70mm driver in a sealed system. They are quite light (500g) and can be mounted directly on the wall if desired, but small L-shaped stands are supplied which can be used to support them on a credenza or bookshelf (in either 'portrait' or 'landscape' orientation as desired).

The remaining key component of the Vision Plus system is the IR remote control, which is really its main control panel. It's essentially a two-hand job, measuring 168 x 123 x 42mm and weighing 300g, with most of the control functions made via its 108 x 62mm touch-screen LCD panel. Augmenting this are a group of 'hard wired' main control buttons below the screen, mainly for Power On/Off, master volume up/down and DVD menu navigation, and another group of smaller buttons on the right for control of your TV.

Down the left-hand side of the touch screen there are five 'always there' touch buttons for System Setup, Display, DVD/CD, Tuner and MD. Similarly down the right-hand side there are five further buttons for selection/control of Video1, Video2, Audio1 or Audio2, and also Macro (the remote can learn function key sequences).

It's *very* comprehensive, and also refreshingly user friendly. You can easily set up channel balancing etc., and even set the time that the LCD's backlighting stays on after the last keypress — up to 60 seconds. This is much better than some systems, where the remote's LCD tends to turn itself off even before you've found the soft key you want to use...

Needless to say the HTZ-7 system comes with a comprehensive Operating Manual (in about six languages), and a complete set of power, interconnecting and speaker connection cables. There's also a set of batteries for the remote control; it takes four AA cells.

YOU'LL NOTICE THAT I HAVEN'T MENTIONED ANY DISPLAY, BECAUSE THERE

What we found

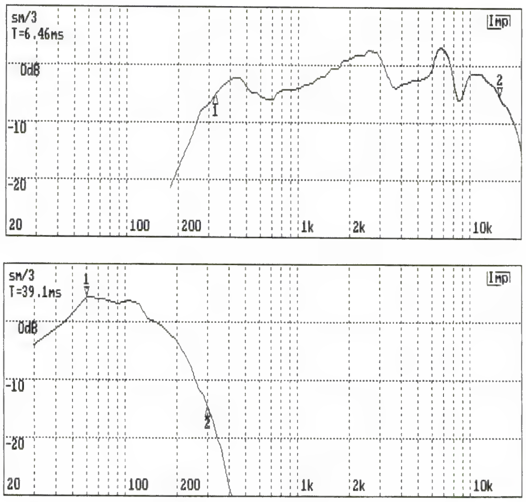
Testing this sort of integrated system is always a bit more tricky than with separate components, because some of the components are permanently connected together internally (like the subwoofer and its amplifier), and can't be accessed separately without pulling the boxes apart. There's often also a certain amount of 'custom tailoring' of the performance of some parts of the system to compensate for that of others. Which is all fine of course, since the components are meant to be used together anyway; but it does make the job of a reviewer a bit harder.

Still, I was able to carry out a reasonable number of measurements. For example I checked the audio frequency response of the DVD/CD player, which is always a good guide to overall performance. Measured at the Tape outputs, this turned out to be very smooth and almost ruler flat, drooping very slowly to be only 0.15dB down at 20Hz and 1.25dB down at 20kHz. The square wave and impulse tests showed a better-than-average transient performance, with about 12% overshoot and well damped symmetrical ringing — indicating fairly good phase response for the post-conversion filters.

Similarly the fade to noise test showed good linearity down to the -80dB level, although I couldn't measure signal/noise or dynamic range figures much better than 90dB or so. This seemed to be due to 50Hz hum and its harmonic components, which I suspect are the result of 'virtual earth loop' problems associated with switch-mode power supplies. Even my usual trick of using an isolating transformer didn't work.

Checking the response from the Audio1 inputs to the Tape outputs gave even better figures than from the DVD player. Here the response was flatter again, measuring -0.4dB at 10Hz and -0.2dB at 20kHz, but with a steep rolloff above 21kHz (presumably to ensure clean recording via digital systems). This all suggests that the system's 'front end' is very smooth and clean over the audio spectrum.

It was harder to make meaningful measurements on the power amps and speakers, especially when it came to the subwoofer. However I was able to measure the outputs of the satellite speaker amplifiers, and found that they appear to be conservatively rated at 30W RMS. I measured just over



The response of the satellite speakers (top) and subwoofer (bottom), measured along with their amps using the IMP testing system. They mesh together nicely, to give a well balanced response from 30Hz to above 16kHz.

36W/channel at 1kHz before clipping, drooping to 32.8W at 400Hz and 34.9W at 10kHz. It was still just on the 30W level at 20kHz, too.

When I measured the frequency response of the satellite amp channels from the DVD player and Audio1 inputs right through to the speaker outputs (connected to dummy loads), the results showed the expected bass-end rolloff (3dB down at about 250Hz), to limit the bass reaching the satellites. The upper-range response varied with the two input sources, though: the response from the DVD player showed a relatively flat high end until the rolloff at 20-21kHz, while that from the Audio1 input showed a broad rise to about +3dB at 12kHz, and then only a slow droop to the rolloff. Perhaps the difference is to make analog audio inputs sound 'brighter' and more comparable with the digital inputs.

ANY; THAT'S SEPARATE...

Luckily the IMP speaker testing setup was operational again, so I was able to check the response of both the satellite speakers and the subwoofer (including their amps in each case). And the results were reasonably good, showing a few bumps and lumps but overall a fairly smooth response from 300Hz to 16kHz or so (+/-3dB) for the satellites and from 30Hz to beyond 200Hz (+/-3dB) for the subwoofer. The crossover filtering slopes were close to complementary for a crossover at about 250Hz, too, suggesting that the overall system would be well balanced.

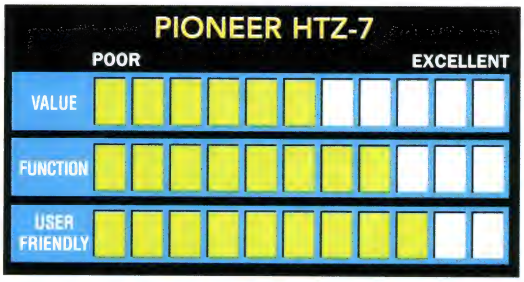
I also checked the video performance of the HTZ-C7's DVD player, using the test patterns on the Video Essentials DVDI 0711 test disc. Using the Sony VPL-CS1 projector and an S-video cable it was clear that the player's video decoding and DAC were giving very good horizontal resolution: the 5.75MHz pattern was easily resolved, and there still reasonable output to about 470 lines. There were no discernable colour artifacts on the Snell & Wilcox 'moving Fresnel zone plate' pattern, showing low Y/C crosstalk, and the colour bar transitions were clean — showing good colour bandwidth and phasing.In short, the video performance was very acceptable indeed.

Reassured by these results, I hooked up the complete system again and proceeded to try some listening tests. For these I first used both my usual reference CDs and familiar scenes from movie DVDs, and then over the next couple of nights watched a couple of complete movies with Dolby Digital tracks. One was *The Fugitive* on DVD, and the other *The English Patient* on Laserdisc.

Overall I was very impressed. The sound from music CDs was very clean and transparent, with good stereo imaging, and that from DD movie tracks was even more satisfying. The surround sound steering is very well defined, and there's plenty of 'grunt' in the usual explosion and crash scenes. The train/bus collision near the start of *The Fugitive* was very convincing, for example.

My conclusion is that Pioneer have made a good job of balancing the subwoofer and satellites, then. And really the same comment applies to the HTZ-7 Vision Plus system as a whole: it's a well balanced and nicely performing package, capable of delivering very satisfying home theatre surround sound performance as well as very acceptable video image quality.

I guess the only real drawbacks I can see are that it won't decode DTS or MPEG2 tracks, and that the DVD player doesn't provide component video outputs. Neither of which is likely to be a major problem, of course, although you could argue that for the price of the HTZ-7 system it would be reasonable to expect them. **ea**



SUMMARY

- An integrated home theatre surround sound system combining a DVD/CD player with Dolby Digital decoder and powered subwoofer/satellites speaker system.

KEY FEATURES

- Detached display panel.
- 'Super' IR remote with touch-screen console.
- Bitstream inputs for Laserdisc, etc.
- 50W + 5x30W power amps built in.

PROS

- Provides virtually everything for a DVD-based home theatre system apart from the TV or video projector.
- Good solid sound and picture performance.

CONS

- Decodes only Dolby Digital tracks, not DTS or MPEG2.
- Provides only composite and S-video outputs, not component video.
- A bit pricey, considering.

RRP

- $4309

AVAILABLE

- Pioneer AV dealers, or contact Pioneer Electronics Australia on 1800 338 439.

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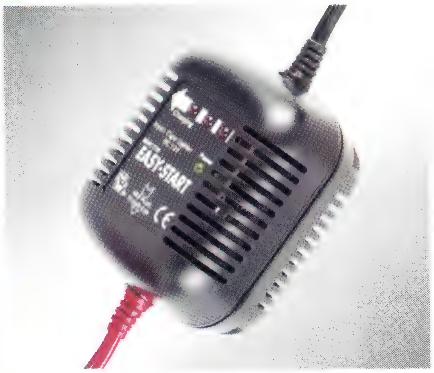

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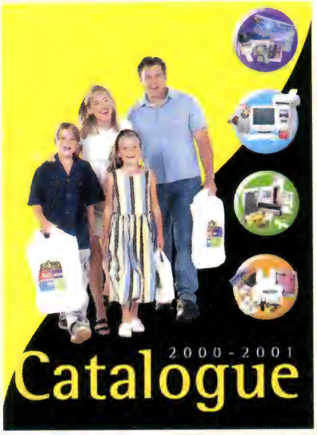

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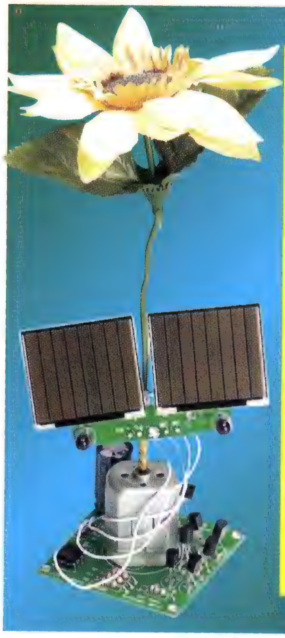

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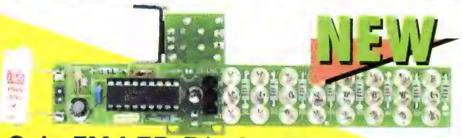

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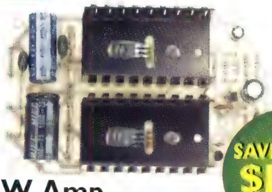

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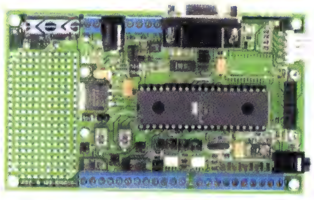
HOT CHIP Maxi Pack



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THE BLINKERS COME OFF GPS

ON THE SECOND of May this year, in preparation for a keep-fit walk of several kilometres, I fired up my GPS receiver to keep track of how far I had gone. It sat there for a couple of minutes, as usual, sucking position information from several satellites, and then it announced it was all locked on and ready to go.

But the part of the display that indicates Estimated Position Error (EPE) claimed the position was accurate within 22 feet. This couldn't be right; the thing usually read 60 feet or more. Maybe it had kicked itself into meters instead of feet display. But when I got moving, the position tracking was a lot better than usual too. What was going on?

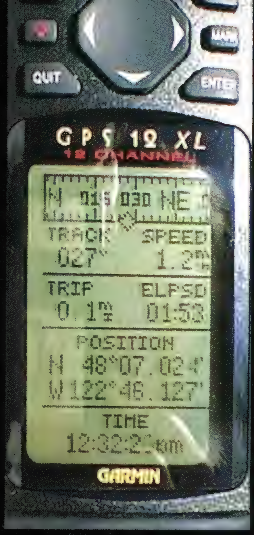
Later I logged onto the GPS Internet newsgroup to find everyone else marvelling about their performance too. And in the middle of it all, someone had posted a copy of an official statement from President Clinton:

"Today, I am pleased to announce that the United States will stop the intentional degradation of the Global Positioning System (GPS) signals available to the public beginning at midnight tonight. We call this degradation feature Selective Availability (SA). This will mean that civilian users of GPS will be able to pinpoint locations up to ten times more accurately than they do now..."

In the original GPS article last December, SA was briefly discussed as if it were an immutable fact of life, to prevent hostile countries using GPS to aim their missiles at the USA. Nobody thought SA would ever be turned off. So, the Clinton announcement was a bolt out of the blue. Why was SA being removed now? Cynical people like me would note that Vice President Al Gore, who is running for Clinton's job in November, was given some of the credit. But would voters notice? How many use GPS?

Not many now, but swarms of them by 2002. This is the result of a decree by the US government's communications arm, the FCC, that all new cell phones must include GPS capability. The program is called E911: E is for enhanced, and 911 is the number Americans dial in an emergency, like 000 in Australia. With E911, any cellphone that connects with 911 will report its position as a GPS fix, even if the caller is panicked or lost and unable to provide a location himself. With SA in force, fixes would be slipshod at best, but with SA disabled, you could fix a person's position to a particular building, or even a particular room.

This is indeed a noble goal, because 911 dispatchers have had much difficulty trying to determine who's calling on a cellphone, and from where. Sometimes they can't even figure out which town the call is coming from. So E911 will certainly save lives. But the technology in an E911 cell phone raises some scary possibilities for other uses.



What is GPS?

"WHERE AM I?" – surely one of the most asked questions in human history. Through the ages, various means of navigation have been developed, from coconut shells and string, through to sextants and the LORAN system of radio positioning.

In 1993, however, a totally new system was launched, which would render obsolete all previous forms of position fixing. The Global Positioning System, or GPS, is a network of satellites orbiting the earth, which in conjunction with sophisticated receiving equipment, enables users to accurately fix their position anywhere on the planet to within 100 metres.

The GPS system was developed over a period of 20 years, by the US Department of Defense at a cost of over 10 billion US dollars. It consists of 21 satellites orbiting the earth at an altitude of 20,200km, each completing an orbit every 12 hours.

Spaced at 60 degree increments around the equator, the satellites are positioned so that a minimum of four satellites will be overhead anywhere in the world at any given time, (although there are usually at least eight satellites in range most of the time). Three spare satellites are also in orbit, any of which can be quickly repositioned to replace an operating satellite that may have failed.

The 21 main satellites constantly transmit radio signals that can be picked up by ground based receivers. By utilizing standard triangulation methods, combined with the accurate timing signals sent by the satellites, remarkable accuracy can be achieved.

The receiver itself is a passive device – it doesn't transmit to the satellites, it can only receives the precise timing signals transmit-

What is...

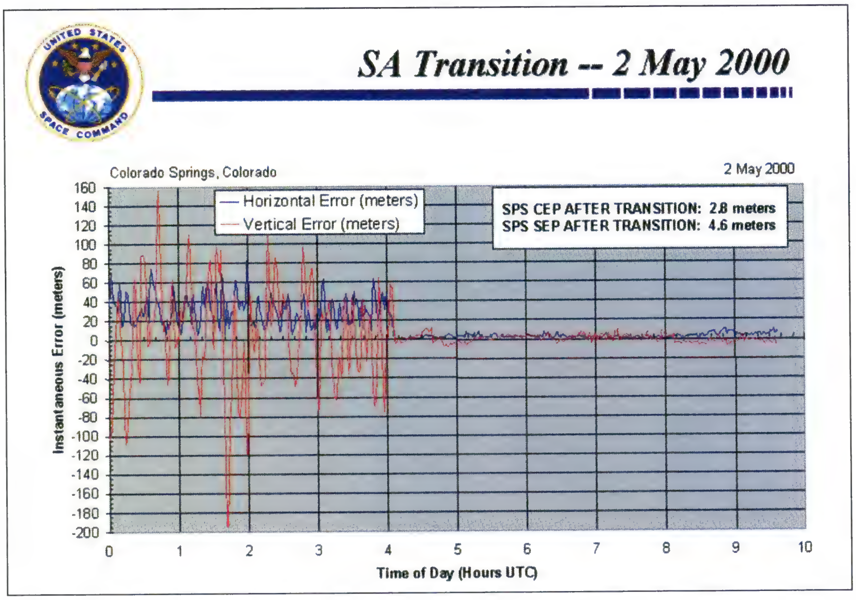
ted by any satellites above the horizon. The satellites transmit on only two frequencies: 1575.42MHz and 1227.60MHz. You might wonder how 21 satellites can transmit on only two frequencies and not interfere with each other. The answer is that the carrier is modulated with pseudo-random noise that can be precisely extrapolated by the ground based receiver. The receiver can then duplicate this noise, and subtract it from the hash of the received signals using some clever DSP.

As the receiver can predict the signal that would be generated by any one satellite, it can find what it's looking for in all the noise. The signals from all the other satellites, not being decoded, combine together to form a level of background noise that the receiver can safely ignore. This procedure is repeated for each satellite in range, to give a minimum of four decoded timing signals from which the receiver's position can be determined.

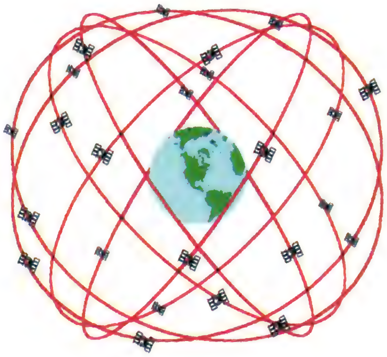
The maths involved in this procedure is hideously complicated, a simultaneous equation with such lovely unknowns as the effects of atmospheric absorption on the effective speed of signal propagation, the *relativistic* effects due to the high orbital speed of the satellites (each moving in different directions) as well as more mundane factors such as compensation for receiver clock speed errors and internally generated receiver noise.

As well as the time signals, the satellites also continuously send a series of 25 data frames, each containing 1500 bits of data on that particular satellite's orbital position, the GPS time of transmission, and almanac data for all the other satellites! As you can see, the job of assimilating all this data, in real time (update times are typically less than a second) is not a job for the faint hearted, or the low of clock speed. Luckily, a couple of VLSI ICs do all the hard work for you. All you have to do is press a button.

Originally used extensively for marine navigation, the high cost of GPS receivers has put this sort of technology beyond the reach of the general public. The advent of small, handheld GPS receivers in recent years has seen this technology move into other areas, including four wheel drive touring, fishing and bushwalking, to name a few.



Above: *No jiggle! When the SA interference was turned off on 2 May 2000 at 0400 GMT, the improvement in GPS accuracy was dramatic...* **Below:** *The 21 GPS satellites orbit the earth every 12 hours, at an altitude of 20,000km.*



Improved performance

SA was designed to 'jiggle' the GPS signals so random position errors would be introduced in all directions. This meant travelling in a straight line would produce a wobbly track record, sometimes bearing little relation to reality. The map of Fort Flagler (Fig.1) shows two versions of a walk along a beach, beneath a large bluff. The yellow track was recorded last October, with SA busily disrupting it. The red track was made in May, after SA was disabled. What a difference!

SA was shut off at midnight Washington time, which is 0400 GMT. The graph, starting at 0000 GMT, shows violent excursions in both position and altitude with SA running. But four hours into the graph, SA disappears and the graph's gyrations settle down to gentle bumps. It would be fair to say that the whole world full of GPS users was astounded with the result.

Since I got my GPS receiver over a year ago, I've always had a mark or 'waypoint' called HOME recorded right in front of my house. Most times when I fired up the receiver, it would show my position being in the street, or in the back yard, or in the neighbour's yard. The altitude readout was virtually useless. I lived at about 80 metres elevation, but the GPS would quite happily show me living well below sea level.

Now, with SA gone, if I stand on just the right crack on the footpath, the GPS puts me right in the middle of the little HOME icon. If I go inside, the GPS altitude readout shows me climbing the stairs as my position moves into the house. It even shows two different positions depending on whether I'm in the living room or the bedroom.

With the improvement in directional accuracy I have learned that the newer streets in this town run *exactly* north-south or east-west, according to the GPS. The GPS even shows whether I'm walking along the left side or the right side of the road. This kind of performance was just a dream when SA was in effect. Now consumer GPS receivers can be used for some serious position fixing.

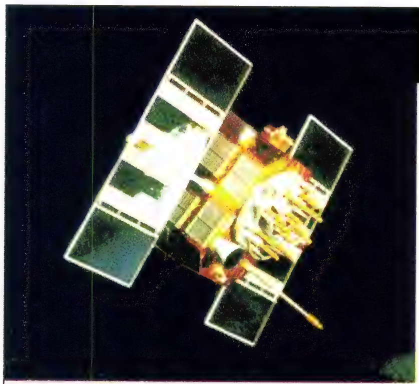
Geocache – a new sport

It didn't take long, perhaps three or four days after SA shutoff, before someone figured out how to use GPS for recreation in its own right, rather than an accessory to travel. Originally called 'GPS-stash', a more scientific name has already been coined: Geocache. Here's the way it works:

You begin with a plastic bucket with a lid, or an ice cream container, or a metal box that can be sealed. Into this, you put some goodies that you don't need any more, but which might be useful to someone else. You also include a log book and a

Above: *The charming bunker where Tom was supposed to find the elusive GPS-stash - his hi-tech 'treasure' hunt turned out to be more tricky than he expected.*
Below: *Great fun, but the spoils were nothing to write home about.*

GPS is watching you



IMAGINE that you have a cell phone and a GPS receiver in the same box, and a means to connect them together. Well, that's what an E911 is, and this 'connection' is supposed to happen only when the user calls 911 with an emergency.

The trouble is, that there is nothing to stop the basic equipment from announcing the cell phone's GPS position even when there is no emergency. The user wouldn't even have to be making a phone call.

All it would take is some simple software so an organization such as the police could send a special code, followed by the phone number. The phone would not ring; instead, it would quietly spit out its GPS position – on a continuous basis if required. Here we would have the perfect people-tracker. It could even be made to work when the phone is nominally 'off'. With mobile phones, 'off' is just another user software command that can be easily overridden by the service provider, the police, or...

There is already equipment like this on the market, for cars. General Motors provides a system called OnStar for its high-end models. The driver has a big pushbutton mounted above the mirror. If trouble occurs, it's only necessary to push the button to call for help. OnStar sends the car's GPS position to a service centre, from where an 'advisor' speaks back to the driver. If an ambulance or tow truck is needed, the car's onboard GPS can pinpoint its location exactly.

However, the OnStar system is quite capable of activating without anyone pressing the big button. If the car is stolen, the OnStar service centre can command it to transmit GPS-derived tracking signals, unbeknown to the thief. It seems possible that police could get a court order to force a service like OnStar to energise the GPS tracking system of any car, such as one suspected of carrying drugs. Or dissidents. Hand-held GPS / cell phone units could be made to behave the same way.

Big Brother isn't watching you; he's just following a string of blips on a map, generated by the cell phone you carry everywhere. We should keep an eye on this...

Navigating back into history

FOR WELL over a century, surveyors have been marking the positions of important buildings, geological features, military facilities, and other landmarks. Many of these things are long gone now, but their positions have remained, recorded in history. Surveyors in the old days could plot positions with remarkable accuracy, orders of magnitude better than we can with a handheld GPS receiver.

In the USA, the National Geodetic Survey keeps an online database of every marker in the country since the year dot. They're on the web at **www.ngs.noaa.gov/datasheet.html**. Markers are labelled with a Permanent Identification number (PID), and each PID datasheet contains a detailed description of the marker's location.

In Port Townsend, PID number TR1638 marks the cupola of the Morgan Hotel that was built about a century ago. But Mr. Morgan went broke before the hotel was completed. It never opened, was abandoned, and finally fell to ruin. But with your GPS, you can stand directly beneath the ghost of the cupola and imagine what might have been.

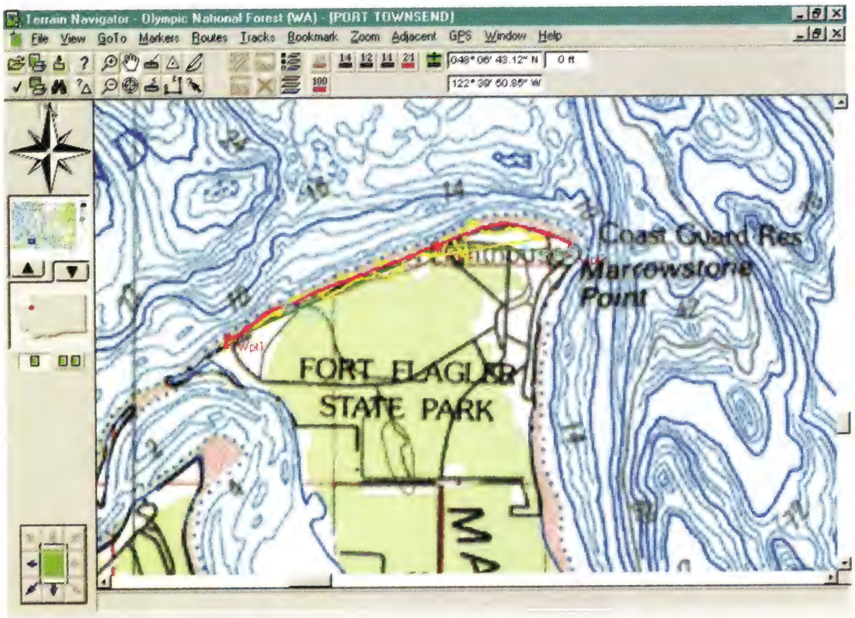
Chasing down other interesting-looking control points has revealed coastal observation points and bunkers abandoned years ago and mostly forgotten. The data sheet for TR1637, Middle Point, shows an observation post and mentions a trail up from the beach. But the "trail" turns out to be a thick chain, moored to an iron post at the top and thrown over a cliff.

Apparently, you're supposed to climb down it. There's no assurance the chain goes all the way to the bottom and it would be unpleasant to run out of chain a third of the way down. You could approach Middle Point along the beach, using the GPS to show exactly where the chain should reach bottom. This is preferable to discovering the bottom by falling thirty metres.

Historic GPS is a fun time warp where things share the same place at different times. For instance, you can walk up to a guy working on his yacht in the Boat Haven and say "Do you know there's a railroad water tank sitting on your boat?" (That's marker TR1719.) Or even more fun: for marker TR1703 you can approach the owner of the expensive home on the site and say "Did you know your house is sitting right on top of an old tuberculosis sanatorium?

I've snooped around the Internet in Australia hoping to find a source of equivalent survey markers, but so far without success. Perhaps a knowledgeable reader can help?

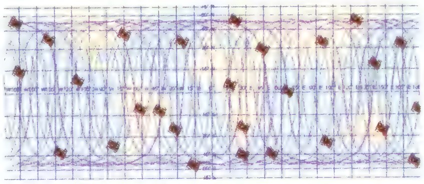
Fig.1 (below): *Two GPS recordings of a walk along the beach at Fort Flagler State Park. The yellow line is the SA-disrupted result from last October, while the red line was recorded in May – after the intentional disruption was removed.*


Terrain Navigator - Olympic National Forest (WA) - [PORT TOWNSEND]
048° 08' 43.12" N
0 ft
122° 39' 50.85" W

pen or pencil. On the outside, you write "GPS STASH". You hide the stash somewhere out in the boonies and then use your GPS to get the coordinates of the stash location as accurately as possible. Finally, you publish the stash's latitude and longitude on the Internet, and challenge other GPS users to find it.

This is a lot like the hidden transmitter hunts (fox hunts) that radio amateurs enjoy. But in this case the target doesn't need to emit any signals on its own; all homing information is derived from satellite signals. So, the GPS stash can be placed underground – or even underwater – providing a whole new level of challenge compared with a two-dimensional radio fox hunt. Many GPS stashes contain a note with coordinates for a different stash, so you can go from stash to stash to stash, making a nice day-long treasure hunt.

There are already some hard and fast rules involving GPS stashes. When going hunting, you should take with you something you no longer need, which you can donate to the stash. When you find it, you leave your item behind and exchange it for something new from the stash. It is considered very bad form to raid a stash without leaving something in return. It is also a no-no to move the stash to a different location – you should put it back, just like you found it.



By sheer good luck, one of the earliest GPS stashes was planted within walking distance of my home in Port Townsend, Washington, so I decided to find it. I plotted the published coordinates (48 08.382N 122 46.080W) into my Terrain Navigator mapping software, and then copied the position into my GPS. The map revealed the stash was in Fort Worden State Park, an old military base that had been converted to recreational use. The park includes a large hill, which is riddled with gun emplacements and underground bunkers ready to do battle with enemy ships that might try to attack Seattle via Puget Sound. The stash was right near the top of Artillery Hill.

The stash's owner, Bob Kegel, provided one clue: the stash was "in a bunker west of three concrete columns". I'd spent a lot of time bushwalking up there, so I knew where the three columns were. By then the stash position programmed into the GPS was less than 50 metres away. Trouble is, I knew where all the big bunkers were and they were a lot more than 50 metres distant. So, I decided to walk to the stash position as shown by the

GPS and see what I could see.

Walk? Scrub-bash is more like it. The whole area is a jungle of ferns and ivy and stinging nettles and fallen trees. But I finally found myself standing right on top of the GPS mark, with no bunker to be seen anywhere. What I did find was stuff like an old generator dissolving into a pile of rust, and even a complete radar antenna that had fallen from a long-forgotten mast. The antenna itself was made of aluminium and had survived the years well.

Into the ivy

I decided the GPS fix might not be all that accurate, what with the thick vegetation everywhere, so I went back to the three columns to march back and forth to figure out exactly where west was. (A GPS receiver must be moving to establish direction.) I then went scrub-bashing again, heading west. This brought me to a clearing, edged by two enormous clumps of ivy. And that's all.

At this stage, legs bleeding from stinging nettles, I decided I'd earned the right to cheat a little. I returned home and emailed Bob Kegel to ask for more hints. This time he said the entrance to the bunker was hidden by ivy. So, the next day I returned with a torch and a big stick, intending to probe the clumps of ivy I'd found the day before. But when I knelt down for a closer look, there was a small opening in one clump, and beyond it, a concrete passage. Bingo!

So in I went, contemplating what I would do if there were a mountain lion relaxing within. The passage turned, and turned again, opening into a large chamber. I began searching with my torch, along the floor, the walls, even up against the ceiling. No stash. That night, I sent another e-mail to Bob Kegel with a photo of the chamber. Was that the right bunker?

Well, nobody said the stash had to be visible. It was indeed in that room, but I'm not going to reveal any more to prevent ruining someone else's fun. I took his stash outside the bunker, inspected it and photographed it, and traded a spare computer board I had for a CD-Rom with some software on it. Other items on offer were some music CDs (mostly bubblegum music), a small calculator, and a can of beans.

That was a shoddy effort for my first attempt at stash finding. It took three trips up Artillery Hill with cries for e-mail help in between. In the end, Bob's GPS position was only about twenty paces out, not bad given inaccuracies caused by all the vegetation. It was certainly Jolly Good Fun, to the extent that I may be planting a GPS stash of my own. Keep a watch on the official GPS-Stash web page:

http://www.triax.com/yngwie/gps.html

Searching techniques

Once you are near your stash or historical marker, ready to nail it down, you should disable the GPS's battery-saving feature. It saves power by reducing the sampling rate and the number of satellites uses, and thus compromises accuracy. You should also turn off the display of your track log, so all that's left on the screen are your position and your target's position, with no messy lines.

As mentioned earlier, the GPS system has no knowledge of the direction from itself to a target object. Instead, it relies on direction of travel, so to make it point at something you have to keep it moving. Once you have a fair idea of where your target is, you can move away perhaps 50 metres and then walk steadily toward your target as the GPS regains track and displays the target's changing direction as you move. At some stage you will walk right past the target, and the screen will show it moving from ahead of you, to beside you, to behind you. You will then know the target's position within a few metres.

Finally, forget about direction and move experimentally forward, backward, left, and right. You will see the DISTANCE between you and the target change, and some creative shuffling will eventually have you standing right on top of the target as the distance reaches zero. But there is still that small GPS error to contend with, so from then on you'll have to rely on your eyes.

This activity would never have been possible with SA still active. So now is the time to pay homage to the US Space Command and President Clinton and Al Gore who wants to be President. But lets hope it's not their real intention to track the whereabouts of every person in the country, or the world. ea

FEATURES

Modern handheld GPS systems boast an impressive range of features, including:

- Current latitude and longitude (or UTM map coordinates)
- Current elevation above sea level.
- The ability to define a number of waypoints or 'landmarks' along which a course can be plotted.
- Total distance traveled from start of journey.
- Current heading and bearing as well as the distance to a designated landmark.
- A backtrack feature, enabling you to retrace your steps.
- Estimated time of arrival at a designated landmark, based on average speed and direction.
- An intelligent automapping facility that shows the course traveled.
- Satellite locked time and date readout.

At a glance

- **GPS (Global Positioning System) is a satellite-based navigation aid that offers a highly accurate positional fix, anywhere on earth. Up until now, 'noise' has been added to the system available to the public, resulting in degraded performance that translates to positional errors of up to 50 metres.**
- **With the recent removal of this noise (by the US Government), GPS accuracy has improved the positional accuracy tenfold, with resolutions of less than two metres possible.**
- **This high resolution position-fixing has opened up a number of new applications for GPS, including emergency services and recreational uses, but at the same time it allows technologies to be developed that can track people's movements, perhaps without their knowledge.**

Control the Universe

E-pilot Universal Remote

The SRC-9200 from Altronics can replace up to eight standard IR remote controls. All operations are via a touch-screen LCD and it's a true 'learning' device, which can be programmed very easily from your existing dedicated remotes. **By Jim Rowe**

IF YOU'RE LIKE many people nowadays, your loungeroom or music room/home theatre probably has quite a collection of remote controls. One for the TV, one for the CD player, another one for the VCR, one for the DVD player, perhaps one for the hifi/AV amplifier and possibly others. Quite a clutter, in fact.

What amazes me is that the very one I want is always the only one *not* in sight, too — how do the designers manage that?

Anyway, solutions for this problem are now available, in the form of the 'universal system master' E-Pilot SRC-9200. It has the ability to learn all of the remote control codes for each of your video or audio components, so it can take over from all of your dedicated remotes.

Judging from the number of buttons on most separate remotes, you'd perhaps expect that a universal remote like the SRC-9200 might have a veritable forest of buttons; not so. In fact it doesn't have any at all. Well, not conventional 'hardware' buttons, anyway.

Instead it has a touch-screen LCD which is effectively many sets of 'soft keys' in one. The number and configuration of these soft keys change to suit each device that you're controlling, like a set of custom templates.

I'm jumping the gun a bit, though. Let's introduce the SRC-9200 itself a little more, before we delve into the details. First of all, it isn't huge; only 180 x 82 x 28mm in fact, about 50% larger than a typical dedicated remote. It's powered by four AAA alkaline cells, and weighs a fairly modest 220g including batteries.

The 110 x 60mm touch-screen LCD occupies just about all of the front panel, while the normal 'transmit' IR LED is in the usual place up at the top centre. There's also a 'learning eye' IR sensor at the centre of the bottom end, to allow the SRC-9200 to learn the codes from the remotes it's to replace. But that's basically it.

Whenever the SRC-9200 is 'awake' (which you achieve by tapping the screen), there are eight main 'equipment select' buttons visible along the bottom of the LCD screen in two rows of four. These are labelled TV, DSS/SAT/CABLE, VCR, DVD, AMP, TAPE/TUNER, CD and AUX. To control each of these devices you simply press the corresponding button — whereupon the rest of the screen immediately changes to a set of soft buttons configured to control that kind of device.

There are also five buttons that remain visible along the very top of the screen. The largest of these is at the top right and marked POWER; it's always used to operate the On/Standby function of whatever piece of equipment you're currently controlling. The four smaller buttons are labelled LEARN, DELETE, MACRO and TRANS, and as you might guess these are used when you're setting up the SRC-9200, teaching it the codes of the remotes it's to replace, or modifying them at any time.

Teaching it the codes from one of the dedicated remotes is quite straightforward. You simply press the LEARN button and hold it down for three seconds, whereupon the SRC-9200 beeps and presents you with a 'security' screen — with four numbered buttons which you have to press in turn, to prevent accidental programming changes. Then you press one of the eight device select buttons at the bottom, to indicate which device you want to program for, and you're ready to roll.

The dedicated remote for that device is placed just at the back of the SRC-9200, with its own transmit LED 30-50mm away from and pointing at its 'learning eye'. It then begins blinking the 'buttons' on its own LCD screen, one at a time, and all you have to do is press and hold down the corresponding button on the dedicate remote, until it beeps and moves on to the next button. At the end of the sequence, you press LEARN again and all of the codes it's learned are memorised.

If there's no key on the dedicated remote corresponding to the button that's blinking during the learning process, you simply get it to bypass that button by pressing the next yourself. (The unwanted 'key' can be switched to 'not visible' mode later, if you wish.)

Similar processes are used to erase the soft key programming for a single device (or even all devices) at any time, and also to get the SRC-9200 to learn 'macros' — complete sequences of control key

SUMMARY

- A competitively priced 'universal master remote' control, able to learn the codes from each of your dedicated IR remotes.

KEY FEATURES

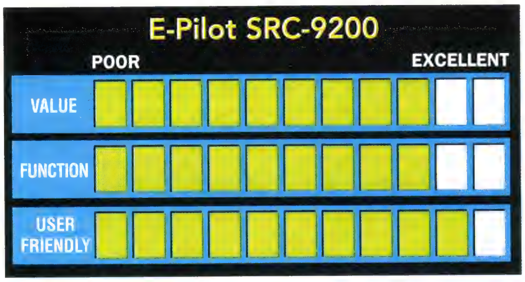
- Can easily control up to eight different devices.
- Learns directly from your dedicated remotes.
- Can also learn 'macro' sequences of up to 25 steps.
- Has adjustble backlighting for use in low lighting.
- It certainly looks the part...

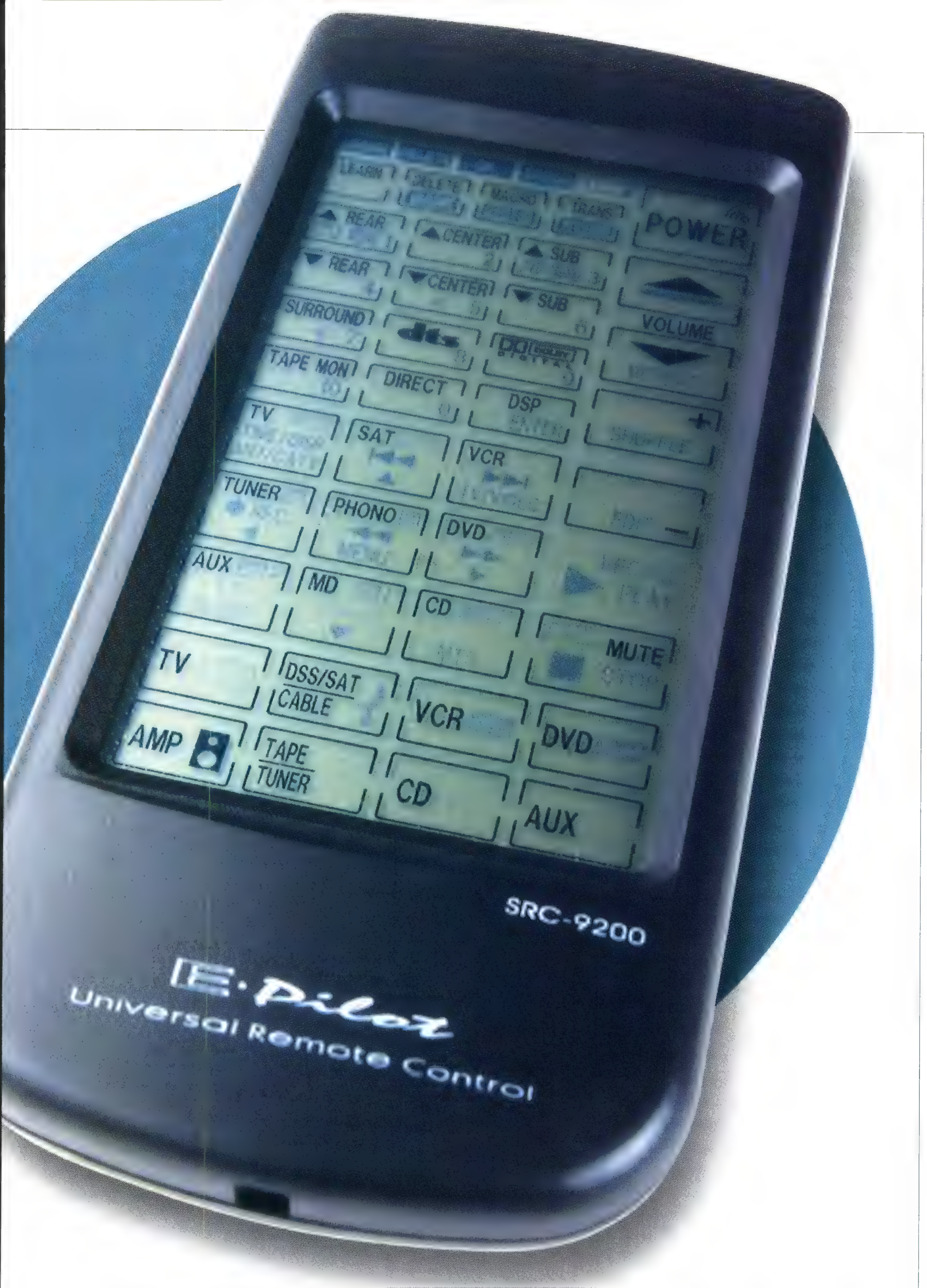
RRP

$209

AVAILABLE

Altronic Distributors, 174 Roe Street, Perth WA 6000. To order call 1800 999 007, or visit: **www.altronics.com.au**.





presses, like turning on three or four devices and setting the mode on each, for a particular function like watching a movie on DVD in Dolby Digital, or listening to a CD in Dolby Pro-Logic surround. Each macro can consist of up to 25 different commands, programmed in to be transmitted from a single soft button press. One-touch system setup!

As you'd hope the SRC-9200 has a backlight for the LCD screen, which comes on automatically when the control is 'woken up' in low ambient lighting. However it only stays on for a predetermined time after your key presses, to conserve the batteries. Another set of special key presses is used to program the delay time (10/20/30 seconds), and also the ambient lighting level where the backlighting is activated. As well you can program the SRC-9200 to either 'beep' in response to key presses, or not if you prefer. It's all very friendly.

Taking control

I was able to try out the sample SRC-9200 shown with a number of my home theatre devices: the Sony TV, the Kenwood DVD player, the Denon LD player, a Panasonic VCR and also my new Pioneer VSX-D508 Dolby Digital AV receiver.

In each case there wasn't any trouble getting the SRC-9200 to learn the control codes from the dedicated remote, and I was soon able to use it to control any of the devices at will.

Frankly I found it very easy to use, and a lot more convenient than I expected. So if you'd like to tidy up your own clutter of remote controls, this solution is well worth considering. It's considerably cheaper than some of the other 'universal master control' remotes, yet is solidly made and seems to do just about everything you'd want. **ea**

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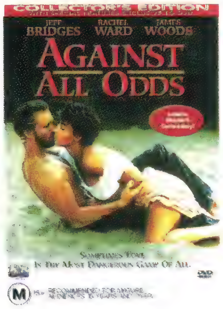
A torrid remake, Mary and the doctor, plus an escapist adventure



Picture:	■■■■■
Sound:	■■■■
Movie:	■■■
Bonus Extras:	■■■■

AGAINST ALL ODDS

Columbia, 1984. Directed by Taylor Hackford, with Rachel Ward, Jeff Bridges and James Woods. Widescreen; colour, 117 min. SS/DL disc, Dolby Digital 4.0; Columbia TriStar Home Video Collector's Edition.

■ A SOMEWHAT BRITTLE and heavy-handed remake of the 1947 thriller *Out of the Past*, with Bridges as a former gridiron football star who is paid by a shonky club owner (Woods) to track down his poor little rich girlfriend (Ward), who has run away to Mexico.

Predictably he does, but falls in love with her and they both strike trouble. It's all pretty cynical, and the resulting torrid sex scenes, car chase and musical interlude seem to have been added merely to increase the movie's box office appeal.

The picture quality of the movie itself is excellent on this Sony Gold Standard transfer, and the sound is pretty good too — although only four-channel surround. As well, there are good range of bonus extras: the original movie trailer, seven deleted scenes (some pretty poor in image quality), two different audio commentaries, some filmographies and two music videos: *My Male Curiosity* by Kid Creole and the Coconuts, and *Against All Odds* by Phil Collins.

The disc makes good value, then, assuming that the movie itself is to your liking. There'd scarcely be a better way to see it in a home theatre situation. (J.R.)

* * *

JULIA ROBERTS JOHN MALKOVICH
THE UNTOLD STORY OF DR. JEKYLL & MR. HYDE
Mary Reilly
M

Picture:	■■■■
Sound:	■■■■
Movie:	■■■■■
Bonus Extras:	■■■

MARY REILLY

TriStar Pictures, 1996. Directed by Stephen Frears, with Julia Roberts and John Malkovich. Widescreen; colour, 104 min. SS/DL disc, Dolby Digital 5.1; Columbia TriStar Home Video.

■ SUBTITLED 'The Untold Story of Dr Jekyll and Mr Hyde', this horror/thriller is based on the novel by Valerie Martin — who retells the Stevenson classic of the mad doctor, but as seen by one of the maids in his house. It's a novel twist, and one that adds an interesting psychological dimension.

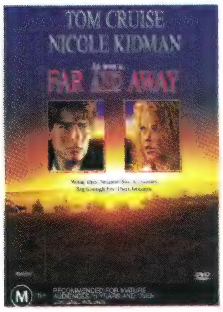
Julia Roberts is impressive as the withdrawn maid, both repelled by and attracted to her warped employer, while John Malkovich is formidable as the doctor and his self-created nemesis. Director Frears builds up to the horror finale with skilfull use of foggy and rainy scenes, and there's only one corny and quite unnecessary 'physical transformation' scene, clearly based on CGI.

By the way, George Cole plays the role of the butler, and Michael Gambon makes an appearance as Mary's drunkard father.

The image quality on this DVD transfer is very clean indeed, and the 5.1 channel sound track is also very good. There's a reasonable set of bonus extras, too: the US theatrical trailer, a 6:45-minute 'behind the scenes' featurette (which looks like a promo piece) and 'talent profiles' of Roberts, Malkovich and Frears.

Overall, it provides an excellent way to watch this entertaining and intriguing movie. Recommended! (J.R.)

* * *



Picture:	■■■■■
Sound:	■■■■
Movie:	■■■■■
Bonus Extras:	■■■

FAR AND AWAY

Universal, 1992. Directed by Ron Howard, with Tom Cruise and Nicole Kidman. Widescreen; colour, 134 min. SS/DL disc, Dolby Digital 5.1; Columbia TriStar Home Video.

■ AN ADVENTURE yarn of epic proportions from Ron Howard, which starts on a dirt-poor tenant farm in western Ireland in 1892, and ends up the following year in Oklahoma USA, with the Cherokee Strip race for free land.

Tom Cruise plays the poor-tenant-lad hero Joseph Donnelly, determined to make good, while Nicole Kidman is the frustrated-little-rich-girl who is just as determined to make a life away from Ireland and her oppressive family.

They both put in quite convincing performances, and this plus the rich story line makes for very enjoyable escapist viewing. By the way there are nice cameo roles by Cyril Cusack and Nial Tobin, as well.

The image quality on this DVD transfer is generally excellent, and the 5.1 channel DD sound track is also very clean and impressive. There isn't much in the way of bonus extras, though — just the trailer, some production notes and filmographies for Cruise, Kidman and director Ron Howard.

Overall, though, the interesting script and the quality of the acting by Tom and Nicole makes the disc well worth watching. (J.R.)

One for the enthusiasts, and electrical basics

REPAIRING VINTAGE RADIOS

VALVE RADIO & AUDIO REPAIR HANDBOOK, *Second Edition, by Chas E. Miller. Published by Butterworth-Heinemann (Newnes imprint), 2000. Soft covers, 247 x 190mm, 270 pages. ISBN 0 7506 3995 4.*

■ The first edition of this book was apparently published in 1982 as the *Practical Handbook of Valve Radio Repair*. For this new edition the author has expanded it and added material on audio equipment, including PA and hifi amplifiers.

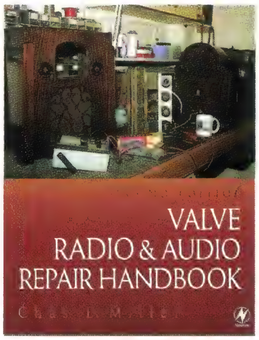
As the title suggests it's mainly practical in orientation, with the emphasis on guiding vintage radio/audio enthusiasts who want to repair and restore elderly valve equipment. About half the book covers basic circuit, component and valve theory, but deliberately only at a depth to give new enthusiasts enough understanding to be able to tackle repairs and restoration with confidence.

There's a lot of useful valve data and other reference info at the back as well, plus part of a supplement from a 1929 issue of *Popular Wireless*.

Overall there's certainly a lot of good down-to-earth information on valve era equipment, albeit a bit ideosyncratic. For example the text studiously uses 'old' terminology and units throughout (i.e., condenser, kc/s and mc/s), and the author explains in his preface that this has been done deliberately to get readers familiar with them in preparation for reading old books, magazines and service manuals. Perhaps that's also the reason for some of the typos (like a grid leak value of 1mΩ) and swapped picture captions too; I don't know.

Since the book originates in England, it does deal almost completely with British, European and a few US model receivers and amplifiers — which may limit its appeal a bit out here, although probably not dramatically. It should still make quite a good reference for anyone interested in vintage radio and audio, although some of the circuits and diagrams are pretty poorly printed. Even some of those that haven't been scanned from old service manuals look pretty scruffy and blobby as well. Perhaps that was done to prepare readers for old literature too...

The review copy came directly from the publisher in the UK, and no information was provided on the local RRP. But copies should be available here by ordering through Butterworth-Heinemann, PO Box 146, Port Melbourne 3207. (J.R.)



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BASIC ELECTRICITY

UNDERSTANDING DC CIRCUITS *and* UNDERSTANDING AC CIRCUITS, *by Dale R. Patrick and Stephen W. Fardo. Published by Butterworth-Heinemann, 2000. Soft cover, 216 x 278mm, 255 and 172 pages. ISBN 0-7506-7110-6 and 0-7506-7103-3. Recommended retail price each $69.95.*

■ Text books on basic electricity abound, but at $69.95 each, these books face an uphill battle to gain acceptance in our TAFE college system. They only cover part of the first year of a trade course, and are competing against cheaper books that are better aligned to the Australian curriculum.

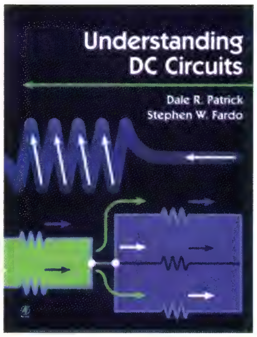
Still, some students like to have as many books as possible to help them through a course, so how do these books stack up against the competitors? Patrick and Fardo have collaborated on numerous books on electrical or electronic theory, so these authors already have local credibility.

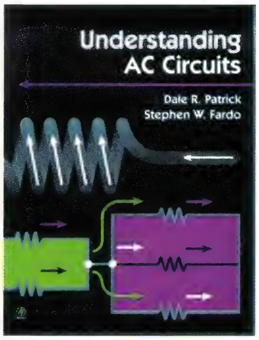
More important is whether the content follows our curriculum, which has recently undergone considerable change. For example, it now includes more mechanics, such as acceleration, torque and the like. Very few books cover mechanics, including the two being reviewed here.

When it comes to basic electricity , these books present most of the information required. As well, they include a range of practical exercises, unlike most local books. However, while the Australian curriculum is identical for first year trade electrical and electronics, these books have a definite electronic bias, making them less attractive to electrical students, which is by far the bigger market.

However, all that aside, these books might just find a place in the market, and are certainly worthwhile additions to a TAFE college library. If you are studying electrical/electronic theory at home, you might find these books useful, especially the exercises, as these only need basic equipment.

The review copies came from Butterworth-Heinemann, PO Box 345, North Ryde 2113. They should be available from technical bookshops. (P.P.)





MOFFAT'S **MADHOUSE**

BY TOM MOFFAT

Reality, and fakery

BEFORE WE BEGIN, I would like to point out that, as of this month, Moffat's Madhouse is ten years old. I've now written 120 of these columns, and I guess somebody is reading them. Otherwise I wouldn't be here!

This month we're going to talk about advances in the cinema and television industries that make it possible to fool just about anybody. Things aren't what they seem at all nowadays. Computers can make anything be anything, and nobody will ever know.

The most talked-about example right now is a film called The Perfect Storm, in which a commercial fishing boat runs into big trouble. Most of the shipboard filming took place on a platform in a tank filled with water. The actors got doused by hoses at appropriate times, but the storm itself existed only within a computer.

This rather stunning piece of work was created by Industrial Light and Magic. They studied real storms, including television footage of rescues taken during the disastrous 1998 Sydney-Hobart Yacht Race in which six crew were killed. Waves in Bass Strait reached more than 25 metres, and still photos of that storm look remarkably similar to footage from The Perfect Storm. The producers even used sensors to measure the movement of real storm-tossed ships, and then reproduced the whole works in a computer. The public loved it, and the film took in $64 million during its first weekend.

It is obvious The Perfect Storm could never have been made in real life; the actors and crew wouldn't have survived it. Much publicity was given to the computer simulation tricks, and that's possibly what drove so many people to the box office. I'm certainly going to go see it when it comes to my small town. But there's a lot of other stuff going on in television production that raises some troubling ethical issues.

Many years ago there was a film producer named Rod Kinnear, unquestionably Australia's best. He was associated with the Nine Network where I was working at the time, and I knew him slightly. Rod thought it would be interesting to see how someone would survive if they were shipwrecked and had to rely on their own devices to survive.

So he made a deal with a brave lady named Jane Cooper. A fishing boat took her to a small uninhabited island south of Tasmania where she was put ashore along with some very limited supplies and one of Rod's cine cameras. Jane had to build her own shelter, scrounge for food and fish, and hopefully survive for a year. Once a month the fishing boat returned with more basic supplies and some fresh film. I don't know if Rod's film ever made commercial release, but I saw some of the raw footage, and it was fascinating. And, one hundred percent legitimate. Nothing faked.

Another adventure

A few years later there was another adventure, only a few short kilometers from Jane Cooper's island. National Geographic magazine was doing a feature about walking Tasmania's South Cape Track, normally a four or five day journey from Cockle Creek to Port Davey. The parties would camp at some beautiful spots along the way.

A bushwalking friend of mine was hired by National Geographic to guide the party. Every night they would arrive at a campsite, set up their tents, and then hop into a helicopter for a trip back to Hobart's Sheraton Hotel, leaving my friend to guard the camp. The next morning they'd all return, freshly showered and fed, and resume their journey. Apparently there was nothing in the resulting article to suggest the use of a helicopter, or an hotel. It was assumed that our intrepid explorers marched the whole way, sweaty and smelly, just like normal people.

To the present: The hottest show on television in the USA right now is called Survivor, with a cast of several Jane Coopers. It's the same scenario; shipwreck and survival on an island. Survivor is set on Palau Tiga island in the South China Sea. Sixteen people survive a shipwreck and make their way to the island, ignoring the danger of sharks and other nasties along the way. On the island they undergo challenges such as bug-eating contests. TV cameras are strategically placed to record the survivors' every move, and mood, and personal relationship, and attack of the grumps. Further drama is generated during regular "tribal councils" in which all residents vote to choose one of their number to be ejected from the island. The last one left standing wins a million dollars.

This, and similar programs, are supposed to emulate 'real life'. The Survivor island is populated by real people, but they are not real survivors. They didn't experience a shipwreck or face shark-infested waters; instead they faced an audition panel of CBS television casting executives, who made sure that the shipwreck were suitably photogenic, and there had to be an appropriate mix of whites, blacks, women, and old guys. Their motivation to 'survive' wasn't to prevent premature death, but the lure of getting their heads (and bodies) on television, and that million bucks. Over six thousand people applied to be on Survivor.

The whole production is supposed to be un-scripted and spontaneous, but one wonders how this can really be with a hoard of TV crews swarming the island. Just as when filming wildlife, the subjects behave differently when a camera crew is present than they would behave otherwise. So, whether they like it or not, the survivors

THERE IS PLENTY OF BRIGHT SUNLIGHT TO PRODUCE A SHADOW. OR IS THERE?

are really actors. Not only are there cameras, but artificial lights as well, or at least large sun reflectors.

The tribal councils are particularly interesting. They begin with all participants marching off into the jungle carrying tiki-torches, eventually congregating in a clearing presided over by a television host. I didn't see many television hosts last time I was in the jungle. The scene is supposed to be lit by a large campfire and the tiki-torches themselves, but there seems to be a lot of other light sources, made to look like firelight. Anyone who has worked in television, as I have, knows how easy this is to do.

And strangely enough, there never seems to be any wind, or animal noises, or the need to swat mosquitoes. Could the tribal councils be taking place indoors, in a studio? Although the survivors must sleep in the wild, a nice accommodation complex is supplied for the TV crews, just out of sight of the survivors' camp. It wouldn't take much more trouble to provide one more small prefabricated building to give producers total control of sound, and lighting, and weather. In other words, a studio.

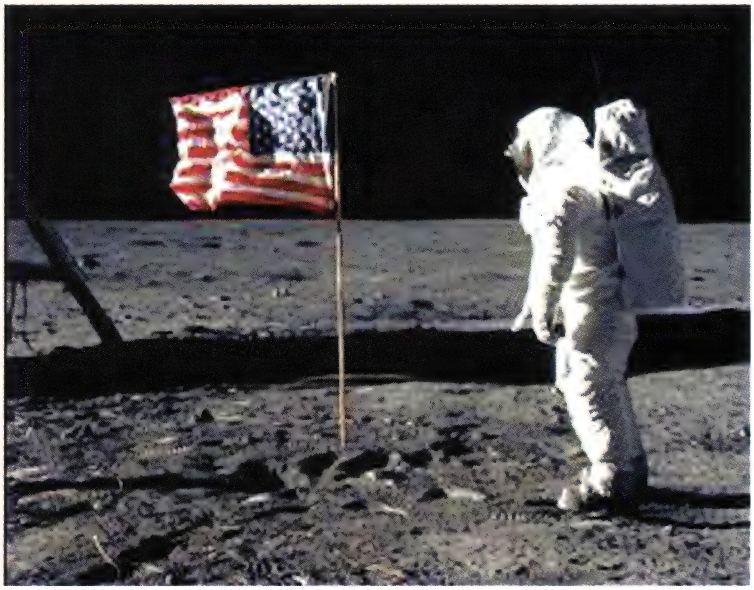
As reported in several magazines, audiences are starting to get suspicious: "I think it's fixed, and I don't buy any of it." But that doesn't stop them watching. Nobody really seems to care what's faked and what's not. I guess the television generation is desensitized to fakery. Australian viewers will get a chance to study Survivor from a closer range. The second series is being filmed somewhere in the Outback, with an air date early in 2001. You guys make sure they give you your million bucks in US dollars!

Big Brother

Another popular show over this way is Big Brother. Here we start with ten carefully picked 'house guests' who share a house, specially built within a TV studio lot in Studio City, California. The participants meet only as they are moving in. As in Survivor, the house is covered by 28 TV cameras and 60 microphones. Each 'guest' is required to wear a wireless mike during every waking hour.

In Big Brother the cameras are hidden behind two-way mirrors, or remotely controlled. So the only humans present are the participants, although an disembodied producer's voice occasionally appears to give them instructions. As with Survivor, Big Brother is supposed to be un-scripted and spontaneous. But again there are doubts. House guests are supposed to have lively conversations to entertain the viewers. But one participant was heard to mutter that he'd got into trouble because he didn't follow the topic the producers had assigned for that evening. Spontaneous?

Big Brother has an ejection process, like Survivor, with the last person remaining winning a pile of money. The first ejectee was a black guy named William who certainly earned the honour with his unpleasant behaviour toward other house guests. Of course, from the producers point of view, this was the whole purpose of Big Brother. 'Reality television'. People ejected aren't at the end of the line; instead they are at the start of a series of appearances on the network's talk shows to discuss their experiences.



Anyhow, halfway through that night's program, at precisely 8:30 PM, the ejection took place. William marched out the front door of the house, across a sun-lit courtyard, and into a television studio where a host was waiting to interview him. As this was going on, a large caption saying "LIVE" was displayed on the screen. However, astronomical records show that the sun set in Studio City that night at 8:03 PM. How come the courtyard was so bright and sunny? Could it be that the "LIVE" segment was "TAPED"? If so, is this behaviour ethical? Is it ethical to lie to the viewer?

This raises a serious allegation that's been doing the rounds for some time. Thirty years ago, the USA was revelling in the success of its mighty space program as astronauts landed on the moon, took off again, and arrived home safely. But many people, even legitimate researchers, suspect the moon landings may have been faked. There was even a feature film, Capricorn One, describing that very concept.

Concern is centred on some of the photos released to the public, of astronauts doing their stuff on the moon. Sometimes things just didn't add up. In the photo on this page, there is a shadow extending directly behind the astronaut. But where is the shadow of the flagpole? There is plenty of bright sunlight to produce a shadow. Or is there?

Given the evidence, it seems most likely that the moon landings did indeed take place. But perhaps the astronauts weren't such good photographers, and NASA thought a more professional standard might be preferable to ensure continuing public enthusiasm for the space program. It would have been easy to produce photos like the flag shot in a darkened hangar. But maybe they should have chosen a lighting guy who realized that all shadows should fall in the same direction. ea

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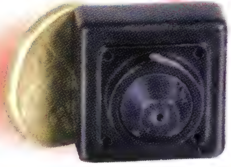
Resolution: 380TV lines, Pixels: 512(H) x 582(V), Min illumination:
2 lux (F2.0), S/N ratio: more than 48dB, Power:

$279

THE $1 COIN CCD CAMERA

NEW



This micro-compact CCD Camera is the smallest we have seen. It measures only 25 x 25mm, the same diameter as a $1 coin. It features a low lux pinhole lens, audio and is supplied in a neat metal case, with mounting bracket and connecting lead.
Specifications: •Image device; 1/3" CCD • Pixels; 500 x582 •Resolution; 420 lines •Sensitivity; 0.05 Lux, F20 •S/N ratio; >50dB •Power; 9 to 15VDC Reg •Current; 100mA

Cat. QC-3473 **$179**

CCD CAMERA DOOR VIEWER

NEW

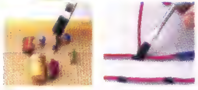
What a great idea! This works similar to those front door eye viewers, where you can see who is on the other side of the door without opening it. With this, you can view the scene on a monitor with out even going near the door. Viewing angle is 170°. Picture is black & white.

LIQUID ELECTRICAL TAPE

NEW

Use instead of insulation tape! Simply brush it on. It won't crack, peel or harden even under extreme conditions. It remains flexible, insulate and seals out moisture. Its acid and salt resistant. Also stops terminal screws from vibrating loose. Supplied in a 118ml can. Black colour. Cat. NM-2832

Only $24.95



FREE STEAK KNIVES!

No we're not joking!

These classic look stainless steel steak knives come in a luxury cardboard box, and will be the showpiece of any kitchen cutlery drawer. To obtain your very own set of 6, simply spend $100* in any Jaycar Store, or Techstore in September & ask for your free set. *Trade customers $250. Not available at wholesale, $100 ($250) must be spent at one time, on one visit, and the steak knives requested then. You must be over 18 years of age.

PROTEK 506 - Computer Connect

BACK AGAIN

This is a brilliant DMM. Look at the features below.
•Dual Display •Bargraph •RS232 Interface •True RMS •Auto / Manual •3.75 Digits •4000 Count •Relative Mode •Recording (min, max, avg) •Time Mode •10 Memories •Data Hold •Back Light •Input Warning •10MHz Frequency •Capacitance •20A •Diode •Inductance •Temperature •dBM •Logic •Continuity •Signal Out •Auto Power Off/Keep On Mode

INCLUDES TEMPERATURE PROBE & CARRY HOLSTER OTHERS CHARGE EXTRA FOR THESE! DON'T PAY $388!!

Cat: QM-1290 **Only $299**

CDR MADNESS

These discs we would call B grade. They are ideal for medium term storage, and are a bargain at the price. Limited quantity available.

BULK PACK OF 10

NEW

Cat. XC-4728
In cardboard sleeve, no case.

$10 Pkt 10

SINGLE DISC

Cat. XC-4729

10 For $12

ELECTRONIC FLURO STARTER

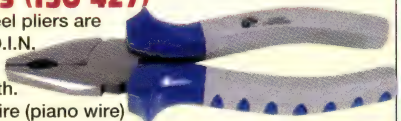
NEW

Uses solid state LSI technology to eliminate blinking and start fluro lamps in less than 1 second. Cat. SL-2758

NOW AVAILABLE **$9.95**

AMAZING! TRADE QUALITY HAND TOOLS MADE TO GERMAN SPECS. AT REALISTIC PRICES.

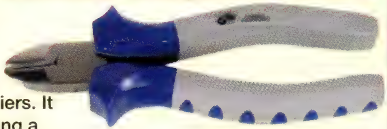
180mm (7") Engineers Combination Linesmens Pliers (ISO 427)



These drop-forged alloy steel pliers are made to the rigid German D.I.N. standards for electrical safety & mechanical strength. They will cut 1.6mm hard wire (piano wire) & soft wire (annealed copper, aluminium, silver etc.) up to 4.0mm. Non-slip double-inset handles withstand up to 1000VAC.

Cat. TH-1984 **Only $23.95**

160mm (6") Side Cutters (Diagonal) Pliers (ISO 427)



This dropped forged alloy tool is made to the same standards as the TH-1984 pliers. It will also cut piano wire & being a dedicated cutting tool is easier to use when frequent cutting is needed. AC 1000V handles

Cat. TH-1985 **$18.95**

170mm (6.5") Long Nose (Snipe) Pliers (ISO 427)

This will probably be the last long nose general purpose plier you will ever buy. Same quality as the other two on this page & same cutting capacity. A very attractive tool with very comfortable 1000 VAC handles

Cat. TH-1986 **$15.95**

NEW STORE NOW OPEN IN WOLLONGONG

354 Keira St
Ph: 4226 7089 Fax: 4226 5623

Thermometer Module with Alarm

NEW

This module can be panel mounted or will simply hold to a surface with the suction cap provided. It features minimum and maximum temperature reached memory, and a high/low alarm function.
Features: •One hour auto shut off •45mm long plastic covered stainless steel probe on 900mm cable •Temperature selectable °F/°C •Alarm beep at the high/low temperature limit •One second normal temperature sensing time •Low battery indicator •Temperature range -50°C to+150°C / -58°F to 302°F •Battery operated G3 included •Size 60(W) x

HOT SWAP IDE HARD DISK DRAWER

NEW

Includes 3 fans

This remarkable device can be used to overcome a number of data storage problems. Use it as a security device that allows you to easily remove the drive from the computer for safe keeping. It can also be fitted with a large HDD and used just like some of the other 'jazzy' removable storage systems, but would cost just a fraction of the price. Thirdly, the drawer allows you to move large amounts of data from computer to computer with a minimum of fuss. Includes 3 cooling fans and features a cleverly integrated locking system, carry handle and self-sealing door.

Don't Forget To Check Out Our Website: www.jaycar.com.au

OVERNIGHT DELIVERY

Jaycar ELECTRONICS Number 1 For Kits

MAILORDERS - FREECALL FOR PHONE ORDERS - 1800 022 888

DIGITAL FUEL MIXTURE DISPLAY

Refer: SC Sept 2000
Monitor the air-fuel ratio of your cars engine in real time ona digital readout and bargraph display. Features three 7 segment displays, bargraph with dot or bar mode and auto display dimming

PC PERIPHERAL POWERUP KIT

Ref: EA August 00

NEW

Powers up your monitor, printer & other peripherals when you turn on your computer, then turns them off when you shut the system down. Compatible with PC's and Macs. Connects to your USB or keyboard port. Kit includes case, adhesive label. PCB, mains power lead & all electronic components. Computer cable required - USB WC-7534 $8.20, PS2 keyboard WC-7532 $8.20 or 5-DIN keyboard WC-7530 $7.95.

SWIMMING POOL ALARM

NEW

Refer: SC Sept. 2000
Save a childs life! This self contained and battery operated alarm floats in your swimming pool or spa. The loud internal siren sounds for 50 seconds when the alarm sensor detects small, though rapid, changes in the pool water level. Kit supplied with sealed case with silk screened panel, PCB, siren, batteries and all electronic

COLOUR VIDEO FADER AND ENHANCER KIT

Refer EA July 2000

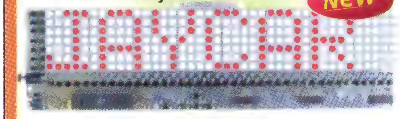
NEW

Cat. KA-1816
$45

RUNNING LED DISPLAY

Exclusive to Jaycar.

NEW



Cat. KJ-8720 **$179**

COMPACT FLUORO LAMP DRIVER KIT

Refer SC July 2000. **$79.95**
Cat. KC-5293

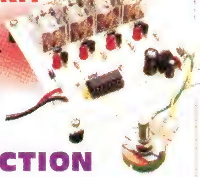
NEW

CD AUDIO COMPRESSOR KIT

Refer SC June 2000
Cat. KC-5291

NEW **$75**

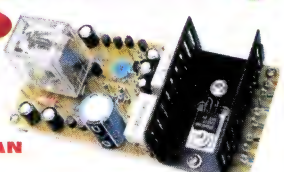
4CH AUDIO VIDEO CCD CAMERA SEQUENCER KIT



See Cat page 7 for full details.
Full kit supplied including case.
Cat. KA-1815
Was $49.95 Save $10
Sept $39.95

SPEAKER PROTECTION KIT

NEW



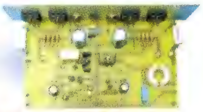
Ref: SC August 2000.

WITH OPTIONAL HEATSINK FAN CONTROL

Cat. KC-5294 **$34.95**

100 WATT ULTRA LOW DISTORTION AMPLIFIER KIT

Refer SC March/May '00
Cat. KC-5288
$89.00
Heatsink not supplied.



POWER SUPPLY KIT FOR LOW DISTORTION AMP

Cat. KC-5289
Refer SC March/May 00 **$29.95**

DIGITAL RAIN GAUGE KIT

Refer SC June 2000
Cat. KC-5292 **$65**

INDUCTANCE METER

Measures inductors between 10uh and 19.99mH. See Cat page15 for full details.
Cat. KC-5271 **Was $86.15**
Sept $75 Save $11.15

ONE FINAL TIME

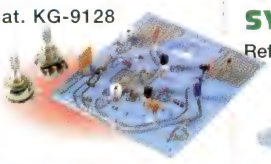
We have made 1 final batch of Pro-Series 3 Stereo Power Amp Kits See '99 cat for specs.
Cat. KA-1760
$599

Electro-Educational Set

Cat. KG-9134
Was $17.19 Save

100-200MHz VHF Converter

Cat. KG-9128



THEREMIN SYNTHESISER KIT

Ref: SC August 00.

NEW

Was $33.47
Now $23.47
Save $10

AURA INTERACTOR BODY BLASTERS

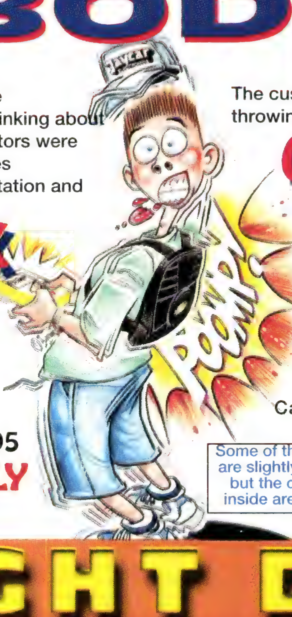
If you thought subwoofers generated low-bass frequency, we guarantee these products will challenge your thinking about sub bass products. These interactors were designed to be used with games consoles such as Sony Playstation and

PRICES SLASHED

BACKPACK

The backpack is more suited to games machines for kids as it can be strapped on to their back for walkaround action. Includes connecting leads for the Playstation and N64. Cat. XC-1000

WERE $269 THEN $49.95
NOW ONLY
$29.95



The cushion version is ideal for throwing on the lounge where you

CUSHION

Simply place one where each person sits, and feel all the action through your back.
Pillow size is approx 320mm wide x 420mm high by 80mm thick at its deepest point. Includes connecting leads for home theatre, TV, Playstation & N64.
Cat. XC-1005

Some of the cartons are slightly scuffed, but the contents inside are perfect!

WERE $47.95
NOW ONLY
$29.95

OVERNIGHT DELIVERY

MAILORDERS - FREECALL FOR PHONE ORDERS - 1800 022 888

OVERNIGHT DELIVERY

EXPERIMENTER'S KITS

These kits are designed to help you understand the fundamentals of DC circuits, motors, generators & bells. They are supplied unassembled & use quality components to build the finished circuits. Spring clips make connections easy & each project is built on its own mounting chassis. Manual & experimental ideas included. Great fun for ages 10 up.

Each kit has a bonus Light Experimenters Kit supplied (as pictured).

2 Kits in 1 - Motor/Light Experimenter's Kit

NEW

Learn the basics of electric circuits and the fundamentals of electric motors and lighting circuits. All components are supplied for assembly onto a neat panel using spring clips. Even the eletric motor itself is supplied in knock down form and requires assembly.

Cat. KJ-7042 **$24.95**

2 Kits in 1 - Generator/Light Experimenter's Kit

NEW

Build a simple dynamo to power the lighting kit (included) or the other kits in the range. Includes simple gearbox and mounts into its own plastic chassis. The lighting kit demonstrates the basics of simple electric circuits and power generation.

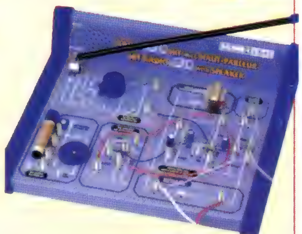
2 Kits in 1 - Bell/Light Experimenter's Kit

NEW

Build an electromechanical bell from scratch and learn the fundamentals of its operation. Combine the bell and light kit together & develop knowledge of the use of light and sound for all sorts of circuits from intruder alarms to battery indicators and continuity testers.

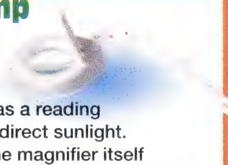
AM/FM Radio Kit

NEW



This is a more complex kit but maintains the spring clip construction method to keep the assembly as simple as possible yet enable the experimenter to build of a real AM/FM radio receiver. The

Desk Mount Magnifier Lamp



This illuminated magnifier features a 22 watt circular fluro built inside the magnifier head. It also features a flip down plastic magnifier cover, which directs more light downwards as a reading light, and protects the magnifying lens from direct sunlight. •An on/off switch is located on the head •The magnifier itself is a 3 diopter lens. Cat. QM-3526 **Only $82.50**

UNDER 1/2 PRICE

EQUATOR ALARM BARGAIN

We found a quantity of an old model Equator Car Alarms in our warehouse. The alarms have basically the same features as our current ones. They do not include a siren, but either a standard or backup battery siren will work. Strictly limited quantity. 12 months warranty. Super code protection, anti code grabbing, code hopping, self code learning remotes, trunk release, silent arm/disarm option. These are in our 1996 catalogue, and sold then for $229. and the price includes postage in Australia. Cat. LA-8905

Only $99 including postage

Available only from our Techstore (Mailorders)

NEW QUICK CONNECTORS

NEW

This new range has the blue crimp cover, and accepts larger diameter cable than the red ones do. Cable entry size for the blue is 5mm, with the actual wire to be crimped between 1.5 and 2.5mm dia. Compare our low price to others!! All packs of 8.

BULLET MALE
Cat. PT-4600 $2.50

BULLET FEMALE
Cat. PT-4602 $2.50

FEMALE SPADE
Cat. PT-4607 $1.95

FULLY INSULATED FEMALE SPADE
Cat. PT-4625 $2.20
Pkt. 50 Cat. PT-4626 $7.95

MALE SPADE
Cat. PT-4609 $1.95

MINI FEMALE SPADE
Spade width 4.8mm
Cat. PT-4622 $1.95

FORK LUGS
Cat. PT-4623 $1.95

EYE TERMINALS
Cat. PT-4614 $1.95

WIRE JOINERS
Cat. PT-4627 $1.95

CAR SOUND WAFER FUSES/HOLDER

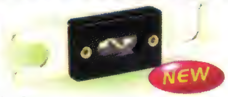
Wafer fuses are designed for really high current applications, and are screwed down offering better conductivity.

INLINE FUSEHOLDER WITH MOUNTING BRACKETS

NEW

This fuseholder has gold plated contacts and will accept both 4GA and 2GA cable. There are 2 "O" rings to keep moisture out as well as grommets each end. Clear construction. Size 145(L) x 32dia. excluding brackets. Accepts wafer fuses. Cat. SZ-2025 **$39.50**

GOLD WAFER FUSES



NEW

80 Amp Cat. SF-1990
100 Amp Cat. SF-1992
150 Amp Cat. SF-1995

$9.95 each

CAT 5e PATCHLEADS

NEW

Genuine Cat5e 350mhz leads in blue colour.

0.5Mt	YN-8200	**$5.50**
1.0Mt	YN-8201	**$7.50**
2.0Mt	YN-8202	**$9.50**
3.0Mt	YN-8203	**$11.50**
5.0Mt	YN-8204	**$13.95**
10.0Mt	YN-8205	**$24.50**
20.0Mt	YN-8207	**$42.00**

LOWER EVERYDAY PRICES ON CAT5 LEADS

Length	Was $	Now $	Save $	Catalogue Number
CROSSOVER LEADS				
2Mt	12.40	9.95	2.45	Cat. YN-8172
5Mt	14.90	13.50	1.45	Cat. YN-8174
10Mt	24.95	18.95	6.00	Cat. YN-8175
STANDARD LEADS				
10Mt	21.98	16.95	5.03	Cat. YN-8105
15Mt	30.60	22.95	7.65	Cat. YN-8106
20Mt	38.26	26.95	11.31	Cat. YN-8107
30Mt	43.05	39.95	3.10	Cat. YN-8109

CAR SOUND SPEAKER DEALS

ALL SPEAKERS HAVE ADJUSTABLE TWEETERS

Voted best speakers by Hot 4s Magazine

Re/sponse car speakers with adjustable super tweeter.

	Cat	Was	Sept	Save
4"	CS-2280	$63.50ea	$50ea	13.50ea
5"	CS-2282	$72.50ea	$59ea	13.50ea
6"	CS-2284	$76.50ea	$62ea	14.50ea
6.5"	CS-2288	$86.00ea	$70ea	16.00ea
6x9"	CS-2290	$94.00ea	$76ea	18.00ea

ANOMEMETER (WIND SPEED METER)

NEW

Accurately measure wind speed and temperature with this handy instrument. Unit can be calibrated for °C or °F and will display wind speed in mtrs/s, ft/min, knots, km/hr or mph. Special functions include wind chill measurements and maximum temp & wind measured. Great for weather buffs & boating types. Features foldaway design, small size, screw mount and safety lanyard. Size when folded 144(L) x 47(W) x 26(D)mm. Cat. QM-1610 **$179**

Save $$ on Sinewave Inverters

Input 12VDC - Output 230VAC. See Cat page 143 for details.

350 WATT

Cat. MI-5050

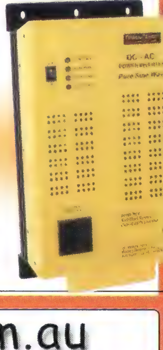
Save $50

Was $399.50
Sept $349.50

750 WATT

Cat. MI-5055

Was $869
Sept $769
Save $100



Don't Forget To Check Out Our Website: www.jaycar.com.au

FORUM

CONDUCTED BY JIM ROWE

Those low power 434MHz transceivers:

some of the responses

In the June column, you may recall, I had a bit of a 'stir' about the way Australia's radio amateurs had heaped abuse on some of the electronics retailers, when they started to sell low power handheld 'walkie talkie' transceivers covered by the ACA's LIPD Class Licence. Not surprisingly I too have received quite a lively response, although not nearly so bad...

I PREDICTED THAT there'd be a fairly strong response to the June column, of course. And remembering what's happened in the past when I dared to criticise hams, I half-expected a veritable 'flame war' of threats and personal abuse. I have to admit that in that respect I was wrong — even though most of the letters and emails came from amateurs, they've all been remarkably calm and well behaved. Whew!

Of course quite a few of them clearly believe I was wrong in criticising amateur radio's reaction to the LIPD ('Low Interference Potential Devices) transceivers, and as you'll see they've tried to show why. That's fair enough; I'm happy to let them state their case, because that's the idea of this column. Our goal is to have open and balanced discussions of technology-related topics, provided that we can all remain civil and respect each other's rights.

So without further ado, here's the first response I'd like to present for your consideration. It came as an email from Mr Eric van de Weyer VK2KUR, a radio amateur who hails from the Sydney suburb of Vaucluse:

> *I am writing in response to your Forum column [June] which I have just read and in particular about the LIPDs. I think there are possibly a couple of points which you have missed or the significance of which you have missed.*
>
> *Firstly, I agree with you about the few kicking up a big stink tarring the rest of us with their brushes. I include you in 'us' as, I believe, you have had your licence probably as long or longer than I have (30 years).*
>
> *I do agree that there was a lot of kerfuffle when the DSE units first came out, as most of us didn't know that they were in the pipeline. I, for one, headed straight for the ACA web page and downloaded the LIPD Class Licence to check on their legality — and found, of course, that they were quite legal.*
>
> *Unfortunately, when the LIPD class licence was being formulated, the WIA had the opportunity to comment but for whatever reason failed to do so or left it too late. I believe that this may have been due to some internal politicking going on at the time. This was shortly before I re-joined the NSW Divisional Council in 1994 at a time when there was a lot of turmoil. I have just left the Divisional Council after six years on it, so these views do not reflect any official WIA stance.*
>
> *When I looked at the specifications of the DSE unit it was quite obvious that they had gone to the trouble of making sure that the channels available in the units would not fall on any existing repeater inputs. With this safeguard, the potential for interference from them was minimised. When, however, the new units from Jaycar appeared, there had been no such safeguard built in and, as you state, they cover 69 channels, basically every 25kHz and therefore being able to operate on all the repeater inputs in their range.*
>
> *One of the requirements with a repeater system is that you listen on the output to check if it is clear before transmitting on the input. This is standard operating practice (for most operators) but is not possible with these small transceivers. Repeaters are, as you know, located in good locations, usually high above the surrounding terrain and therefore able to hear much better than the little handheld so that although the channel may 'seem' clear to the operator of the handheld radio, he may, in fact, be getting into a repeater five, ten or even twenty kilometres or further away without ever knowing it. They may only have a range of about 1km between each other but they certainly have a much greater range in conjunction with good receivers, antennae and locations of repeaters.*
>
> *The reverse is also quite possible. A crane operator, for instance, may be using a pair of these handhelds to direct operations between the ground and the driver up on the crane when an Amateur, quite legally, comes up on the frequency which, for him, has an output 5MHz higher to which he is listening but on which he can't hear the crane operator. Now, imagine the potential for disaster in that scenario. By the way, this is basically what did happen in one case in Melbourne, I believe. There have also been a number of documented cases around the country although I don't have the details but I'm sure the WIA do.*
>
> *Remember also that the Amateurs, as secondary users of the band, can claim and receive protection from interference from the LIPDs which are only under a class licence and therefore are not entitled to ANY protection from interference and MUST move or cease transmission if they become aware that they are causing interference. They receive NO PROTECTION what-so-ever.*
>
> *I agree with you that many Amateurs consider all the allocations 'their' bands whereas, in fact, outside the HF allocations there is only ONE exclusive band and that is the 144 to 148 MHz band in which we are the primary user. On all other bands in the VHF, UHF and above we are secondary users.*
>
> *At the present time the ACA is in the process of re-writing the LIPD class licence so there is the potential for input to the ACA and that opportunity has been put to use. I don't know exactly what submissions have been made but I am sure that they have been made in a rational and sensible way.*
>
> *Very often in the past, the actions of a few 'ratbags' have very nearly undone the good behind the scenes work being done by the WIA trying to look after the interests of ALL Radio Amateurs, members and non members alike.*
>
> *Another, probably little known fact outside Amateur circles, is that the Amateurs, especially in the Sydney area, willingly 'lent' two segments of the 70cm band for use during the Olympics to*

influence over areas of cellphone-health research, or the reporting of the science. And, if you search seriously on some of these names, you'll be left in no doubt as to the role they play in distorting the evidence.

Also, while you are on-line, look at documents relating to some of the US think-tank institutes like Cato, Manhattan and Hudson, or foundations like Heritage and Heartlands. You'll see these organisations laundering funds for the polluting companies, and employing journalists and writers who promote junk-science claims for their patrons. You've got to read quite a few documents to get a feel for how much of this activity was planned and directed.

Claims of junk-science are always directed against the interests of the corporations, never against the science finding in their favour. You can see one of the most subtle of these in operation at a site owned by TASSC, a fake science organisation run by PR firm APCO & Associates for Philip Morris and some oil firms. This is the famous 'Junkscience' site at **www.junkscience.com**.

TASSC's name is no longer displayed at the site, and the operator claims it is owned by a non-existent organisation called Citizens for the Integrity of Science. But if you want to know more about how this scam is organised and operated, add a hyphen between 'junk' and 'science' in the URL.

If I were able to name all of these individuals without spending the next few years in court, I'd be listing hundreds. The systematic corruption of science and the infiltration of the major US health and environmental regulators has been carried on for about thirty years by some of the biggest and richest corporations on the planet.

Tobacco companies in the USA have tended to 'own' politicians from both sides of the divide, and have extraordinary influence over the universities because they often endow the chairs, choose the professors and provide key research funding. Now the cellphone companies are learning from tobacco's mistakes.

Tip of the iceberg

Professor Stanton Glantz from the University of California in San Francisco, the arch-enemy of tobacco, has just written an excellent article on the subject for The Lancet (April 8, 2000). You can find Glantz's article at The Lancet website **www.thelancet.com** by searching on his name. But in my opinion, he has really only seen the tip of the iceberg.

I am promoting the tobacco-comparison line quite obviously, because I think it is important that we all begin to understand just how untrustworthy a lot of our scientific research has become in the 1990s — especially in the biomedical field. The tobacco settlement gives us a unique opportunity to look inside an industry, and see how scientific corruption was organised, and how it operated.

But this is a global problem, and not just one of the cigarette companies. As governments have moved out of funding health and environmental research (more so in the USA and Europe than in Australia, fortunately), the corporation causing the problems have moved in.

On the surface, this appears to be a justifiable approach; it's an extension of the user-pays (or polluter-pays) principle. But there's also the 'who-pays-the-piper-calls-the-tune' principle. So this also means that research with adverse findings is rarely published or revealed, while bad research, designed to serve an unconscionable corporate end, is often widely disseminated and promoted.

In Europe, researchers in the cellphone field need to have dollar-for-dollar matching funds from a cellphone company, before they can tap the European Union's general funding pool, so this gives the companies an effective veto on the use of research funds derived from taxation.

The result is that scientists willing to bend to the wishes of these corporations will get the research dollars, while independent scientists go hungry. The corporate lackeys will also find publication is automatic in scientific journals funded by the corporations, and their reports will be widely promoted through cross-referencing in the literature.

The cream might rise to the top in some situations, but the scum often rises to the top in others. **ea**

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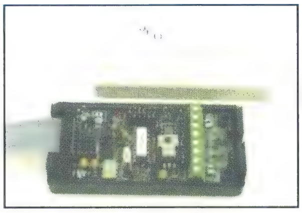

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OPEN FIST

BY STEWART FIST

Tobacco Science

MULTINATIONAL corporations and those industries requiring close collaboration and technical alliances (such as telecommunications), often end up developing a common corporate culture.

Executives of these gigantic and successful companies come to see themselves as Masters of the Universe (to steal Tom Wolfe's term); they feel that they are the power behind the economy. And, as their egos rise, their ethics fall, in about equal quantities.

This has been true to for generations but to a less obvious degree than it is today. The progressive development of globalism and high-tech ubiquity, have greatly exaggerated this trend over the last few decades.

In a speech he made a few years ago, one-time FCC commissioner, Nicholas Johnston, pointed out that there was always this trend in executive circles to the development of a monoculture. "If you poll 10,000 senior executives in telecommunications or broadcasting, you find yourself with a list of 10,000 Members of Rotary", was how he put it.

He wasn't attacking Rotary, but merely pointing out that corporate cultures filter potential employees to exclude those who don't fit, while simultaneously promoting the careers of those who do.

Eventually, almost all industries with any substantial global reach become monocultures, and often they see themselves as a key part of a wider business culture — quite distinct from the consumer or worker cultures that they exploit.

Position, education, associations, expectations, and job functions, tend to throw together people with shared interests and problems, and, over time, fundamental attitudes and understandings of how the world operates permeates widely and are unquestioned. It generally takes an exceptional executive to stand out from the crowd, and look at corporate or sector problems dispassionately or analytically.

So when an industry is under attack around the world by health or environmental activists, the natural temptation is to close ranks, ignore evidence contrary to your company's beneficial position, and use the might of the dollar to defeat the opposition. Money is the best weapon you have.

Same tactics

This is what happened with the tobacco industry, and I believe it is also happening with the cellphone industry. My problem is not with cellphone business, or even with the denial that potential health problems exist, but with how much the corporate lobbyists and manipulators overstep the mark in maintaining their position.

And in grouping cellphones and tobacco together in this way, I am strongly suggesting that both industries protect their multi-billion dollar profits by using the same tactics for a very good reason. Often the same shonky-scientists, lobbyists, lawyers and corporate PR companies run misinformation and diversionary operations for both industries.

That's why I am an avid reader of the Philip Morris documents which are now becoming available on the Internet (**www.pmdocs.com**) since the Attorney General of Minnesota, Hubert Humphrey (III) made public disclosure of old scientific files part of the State's settlement agreement with the tobacco giants.

And in April 1998, after a series of appeals, the U.S. Supreme Court upheld the ruling and said that attorney-client privilege was not applicable to tobacco industry documents because the lawyers had conspired with both the scientists and the tobacco companies.

I can say without fear of contradiction now that the tactics employed by the tobacco industry in the last half-decade were mirrored within the cellphone industry. This happened for the simple reason that the same global and US-local PR/legal companies did the same work, and used quite a few of the same shonky scientists and scientific consultants.

And when the US Supreme Court ruled to remove attorney-client privilege protecting tobacco-scientists, there was a total strike by cellphone industry's own scientists until they received a $1 million indemnity from the industry in the event they were charged in the same way.

If defamation weren't a problem, I'd give you a dozen names of supposedly top scientists associated with cellphone industry research who also did the same work for tobacco companies — and for dioxin polluters. You experience a weird sense of deja vu when you read this literature.

These are the scientists who appear at formal Congressional or Parliamentary inquires (or in the press) making statements about the biomedical or epidemiological science being confused. It often is, of course, mainly because they create the confusion.

Journalist are always wary of suggesting conspiracies, because this form of overstatement is frowned upon in media circles, and replaced by the famous dictum "If the choice is between cock-up and collusion — choose cock-up every time".

But after an hour perusing the Philip Morris document website, you'd have to be Blind Freddy not to see that there is a well-developed science-corruption industry in the USA, run by a few major public relations companies and a whole host of pseudo-science entrepreneurs.

These people offer their services to any company or industry organisation which has a poisoning or polluting problem, and for the global businesses, most of them based in Washington DC.

Distorted evidence

If you've got an Internet connection and an hour or two to spare, visit the Philip Morris document site and search for company and organisations with the acronyms: NPL, APCO, TASSC, SHB, C&B, HES, CSE, SRA and TWG.

Almost all will reveal names of people who have

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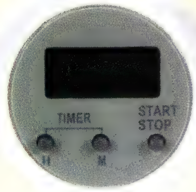

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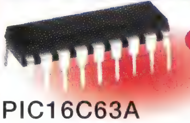

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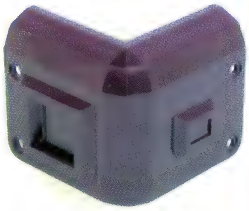

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> *the Olympic Radio Network. Most of us do not begrudge others sharing the band with us. It is a big band after all and has heaps of potential. The only thing we object to is the landing of these potentially interfering devices right on channels which already have active repeaters on them of which the users will have no knowledge.*

Thanks for those comments, Mr van de Weyer. I do appreciate your calm and reasonable response, which inevitably makes it a lot easier for everyone to consider the amateur point of view. (By the way you'll notice that I've dropped your comments on plug packs for the present; I'll try to take up that subject at a later date.)

I take your point about the main objection by amateurs to the LIPDs being with regard to their potential for interference with repeaters, too. In fact this comment from yourself and some of the others who wrote prompted me to enquire about it from the ACA, and as it's important I'll try to present a more detailed discussion of this aspect here very soon.

Continuing with the responses, though, here's a short one that came from reader John Hunter:

> *I thought I'd make a few comments on the topics you've brought up in this month's Forum.*
>
> *I'm in total agreement with you re your observations about radio amateurs. Your phrase, "...an elitist bunch of angry old techies", sums it up 100%. Although I'm not a licensed amateur, I do attend swap meets and read their journals from time to time as well as casually listening to the amateur bands, so I do have some sort of idea as to what's going on.*
>
> *There seems to be a group of hams that are very unfriendly, with a gripe about something and seem to think they belong in some sort of imaginary ivory tower where only they know about things RF and only they should control it. Abuse from these people doesn't surprise me one bit. As a non amateur I have never felt welcome in their elitist circles.*
>
> *The controversy regarding the UHF transceivers is nothing new. I vaguely remember a similar thing with the 11m band being given to the 27MHz Citizens Band, and not so long ago when licencing was dropped from this band. There was also the matter of certain TV channels eating into the side of amateur bands.*
>
> *On a practical level, what is the fuss about? Hams are just as much appliance operators as the likely purchasers of the vilified walkie talkies, with the days of home design and construction gone for most amateurs.*
>
> *1/30th of a UHF band for non licenced users? Well, it would take a lot of NBFM channels to fill the remaining 29MHz, and as you rightly point out, there isn't much activity here anyway. Besides, I'm not aware that hams have been prohibited from using the new low power, unlicensed, part of this band, so it's not as if something has been taken away. If I was using this band as a licenced amateur and heard one of the low power unlicensed transceivers, I'd be more likely to try and strike up a friendly conversation with its operator than abuse him/her or the place that sold it.*

Thanks for your comments too, John. It's interesting to see that your reaction to the behaviour of some of the radio amateurs is much the same as my own — and hopefully at least confirms that I wasn't just making it up.

We're not 'squatters'!

A rather different view, though, is reflected in the next response I'm presenting. This one came as an email from amateur Mr David Jones VK4OF, who made it clear that he was also sending a copy to one of the WIA bigwigs. As you can see Mr Jones was particularly affronted by my suggestion that people in the wider community now tend to regard hams as 'an elitist bunch of angry old techies at best, and at worst a gang of nasty spectrum squatters and thugs':

> *While we are all entitled to our opinions, may I respectfully suggest that far from being squatters in the RF bands, we are more akin to a current-day Park Ranger.*
>
> *You see, the amateur bands are like the national parks of the RF spectrum. Without a place of refuge from commercial interests, the RF spectrum will surely become not unlike the ground over which it passes. Fraught with dangers on all sides, based on argument for and against, and fiercely debated as to what sustainable damage can be occasioned to it without such damage becoming permanently irreparable.*
>
> *With all due respect to your position, may I note that all the experimenting has not gone from the amateur bands, and that several of my close associates actually have world wide patents on commercial standard RF devices. One such person saves his state Police Service untold hundreds of thousands of dollars per annum, all due to his research and development. All of this was done in his own home, and made freely available to the end user. It is in current use today.*
>
> *Hardly the standards of a squatter.*
>
> *Further, I suggest you re-appraise your position in respect of the Amateur Service, for without the purchasing support of people like us, the circulation figures of your magazine will surely reflect the resultant degradation of the overall electronic capabilities of the general community.*
>
> *In the pens of such eminent persons as yourself lies the public perception of a Service which has historically crossed all political boundaries, survived two world wars and the somewhat futile attempts of many regimes and juntas to stamp it out, is non-sectarial, totally apolitical, is not sexist, recognises no state borders but respects the laws of each and every nation, is not biased on the basis of colour or creed, and is lawfully supported by no less than the International Telecommunications Union.*
>
> *Are you sure we rate no higher than 'squatter'?*
>
> *In all but a few areas noted above, we parallel no less an organisation than the Scout Movement, and in Australia, we have existed for about the same time... over ninety years. Surely you would not suggest that such an august Movement is no more than a collective of campers in the national parks of our lands ? Likewise, Mr Rowe, we the radio amateurs of Australia are more than campers in the national parks of the RF Spectrum.*

Thanks for your comments also, Mr Jones. I can sense that my use of the word 'squatters' in particular has upset you, but I was basically trying to describe the degree to which the actions of *some* amateurs have tarnished the image of amateur radio as a whole, in the wider community. I wasn't saying that *I* saw all amateurs as spectrum squatters, just that this is the way many people do now think of them — largely as a result of the behaviour of what is probably quite a small percentage of amateurs. It's unfortunate, and I'm sure very difficult for decent and well behaved amateurs like yourself to accept, but I believe it's true...

I understand what you're saying about amateur bands being the supposed 'national parks' of the frequency spectrum, and the amateurs themselves as their 'park rangers', but frankly the analogy isn't all that palatable. In fact it sounds very much like the kind of elitism that I alluded to in the June column.

Surely what you're implying is that radio amateurs are somehow the only 'legitimate' users of spectrum, as opposed to all other users — who are presumably tainted by commercial or other 'selfish' interests. I think many of those other users would find it pretty offensive to suggest that amateurs therefore have the right to appoint themselves 'spectrum guardians', and the amateur bands as supposedly the last bastions of legitimate and untainted spectrum use.

I'm sure that no one would want to deny that radio amateurs have played an important role in both the development of radio communications and its uses for the benefit of communities worldwide. Or that they continue to do so, especially in times of emergency. But

the fact remains that despite amateurs being a tiny percentage of the total population, the amateur radio service has been granted the use of, and permission to continue using, relatively large amounts of spectrum — in an era when more and more uses for the spectrum are being found, to the benefit of communities as a whole. To suggest that none of these evolving uses is as legitimate or as 'wholesome' as amateur radio seems a bit unreasonable, as well as unrealistic.

Repeater interference

Moving on again, though, our next contributor is Mr Peter Mill VK3APO, who specifically addresses the question of repeater interference:

> *I am writing to comment on your FORUM article in the June 2000 edition of Electronics Australia. The main concern I have, after reading the article, is that you have misrepresented the situation in relation to the 420 to 450MHz Amateur Band. Approximately 30 years ago the Licensing Authority agreed to allow the Amateur Radio Service to install unmanned repeater stations provided that a Band Plan was drawn up, they were licensed by the Authority and were maintained to an acceptable technical standard.*
>
> *The Amateur Service is a Secondary Service within this allocation so these conditions would allow other users of this part of the spectrum to plan any operation around the input and output frequencies. Your article infers that the Amateurs are an unreasonable bunch and they should be prepared to share 1.7MHz of a total 30MHz. The whole reasoning behind licensing the UHF repeaters was that, by knowing where they were, any interference could be avoided to the repeaters and other users.*
>
> *So along comes the LIPDs. There is a whole 30MHz available but it was decided that they would come and play in the corner that the Amateurs were using. The Amateur Radio UHF Repeater system, based on commercial costing, probably represents an investment of between 1.5 and 2 million dollars. The objections from the Wireless Institute in relation to the frequencies of operation of the LIPDs were ignored.*
>
> *There is room within the 420 to 450MHz allocation, but why put them on frequencies that can cause the most interference and disruption?*
>
> *As distinct from your article Jim I found the Dick Smith D-1099 to be a balanced and fair approach to the problem created by the LIPD allocation within the 420 to 450MHz allocation. They selected a number of frequencies that would not interfere with Repeaters which had complied with the Band Plan. The interesting thing about the Class Licence is that the LIPD's are covered as long as they comply with a number of conditions. One of the conditions is "(3 (1) (c) its operation must not cause interference to the operation of another radiocommunications device."*
>
> *Your comment that they are legal would depend on the area of operation. As soon as the owner causes interference they are not covered by the Class Licence and could be considered to be illegal. There have been a number of occasions where the licensing authority have had to track down the offending parties and issue the appropriate warning. The Companies that have decided to sell the devices that cover the complete LIPD allocation run the risk of supplying their customer with equipment that can become unlicensed. I find your comment that Jaycar's units offer a range of handy features including CTCSS of some concern. A number of Amateur Repeaters have had to fit CTCSS decoders to try and minimise the interference caused by the LIPD. The CTCSS is handy for what? Maybe it's so that they make sure they cause as much interference as possible.*
>
> *The biggest concern I have with your article Jim is that it appears that you have let your journalistic flare dominate over what could have been, considering your technical background, a well balances and constructive article. All the information on the LIPD problem is available from a number of Amateur Radio Sources. Amateur Radio has been good to me over the years. It's my hobby and I believe yours.*

Thanks for your comments too, Mr Mill. As I mentioned earlier I have been able to find out more regarding why the ACA chose the small band around 434MHz for LIPDs, and as this seems to be the main key to the current controversy, I'll try to cover this in detail very soon.

However there isn't room this month to do it justice; all we have room for now is one more short email, which came in from an amateur who has asked to be identified as 'Daniel B'. It's very well written and makes its points so sensibly that I thought it made an ideal way to conclude this first round of responses to the June column. And although Daniel B is a radio amateur, his age in itself must help counter the belief that amateur radio is dominated by 'angry old men':

> *I am writing in regards to your comments on the 434MHz LIPDs. Here comes the flame... (only kidding!)*
>
> *I am an amateur radio operator, and one which uses the 70cm band quite often. It is unfortunate that many amateurs will not use the band, as conditions are always perfect, and high-gain antennas can be made quite small and compact (ever seen the size of an 18-element Yagi for 2m?!)*
>
> *What I cannot understand is the amount of whinging that occurs when something affects the amateur radio spectrum. True - interference is annoying, and so is the loss of spectrum to amateur radio users. However is 'flaming' appropriate in this context? No; of course not!*
>
> *It is the abusive comments, letters and emails which make people (such as Jim Rowe) look upon the fraternity with critique. One bad apple can ruin the whole box, and this is what is happening with our hobby.*
>
> *Mr Rowe, may I remind you that people of a bad influence don't exist only in amateur radio. There are nasty golfers, aggressive drivers, and even abusive stamp collectors (sic). Fortunately, many of these people are slowly beginning to fade into the blackness, and fresh blood is slowly seeping into the hobby.*
>
> *From a personal point of view, I have been licenced for nearly twelve months. Every amateur radio operator I know has helped me in one way or another. They have given me technical information, equipment, projects, books, manuals, and just about everything else. No bad-feeling has arisen towards me (to my knowledge anyhow), and people are almost always willing to talk.*
>
> *However, what you say is true Mr Rowe - insults and aggressive behaviour do not help the situation, although we are not all a bunch of bullies! I believe you are being slightly unreasonable (with regards to the loss of friendly experimenters), but it is true that there are people out there who fit your descriptions. Saddening, really...*
>
> *Consequently, if amateurs do not want to lose their spectrum (even if it is only secondary usage) to third-parties, then we must use it! The 70cm band is fantastic, and cannot be lost.*
>
> *For those who are interested in electronics and communications, amateur radio is for you. Study for your licence, enter the ranks, and prove Mr Rowe incorrect! You cannot really make up your own mind until you have actually tried it. For me, the result was positive, and I hope it will be for you also.*
>
> *Daniel B (Age 15).*

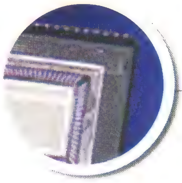
Thank you for your comments too, Daniel, and I'm sure a lot of people will agree that it's great to hear such reasonable and wise words from someone of your modest age. You've chosen a very positive way to defend amateur radio, and even I can hope that more young people take your advice and help 'prove me wrong'! ea

Professional
electronics

page 60

THIS MONTH:

56 Silicon Valley News
57 Solid State Update
58 Review: Powertech PSU
60 Professional Products
65 Subscriptions Offer
66 History & Crossword



SILICON VALLEY

NEWS

IN BRIEF

Vivid buy for National Semi

■ National Semiconductor has purchased closely-held Vivid Semiconductor, a company that specialises in ICs for flat panel displays.

Vivid will fit nicely in National's strategy of targeting the display market which is expected to increase 36%, producing strong demand for the ICs that drive the LCDs.

US$41 billion merger

■ In what will be Silicon Valley's richest high-tech merger to date, JDS Uniphase and SDL, two companies involved in optical fibre and networking technologies, have announced a US$41 billion merger in which SDL will become a subsidiary of JDS. The deal follows just a few weeks after JDS agreed to acquire Uniphase for $15 billion.

Before the merger few people, even inside Silicon Valley, had even heard of either company. Today, the combined unit will rank among the Valley's top high-tech firms along with Hewlett-Packard, Cisco, Intel and Sun Microsystems. The two firms have combined sales of US$1.7 billion and employ nearly 20,000 people.

Japan forms Linux consortium

■ Toshiba, Hitachi, Fujitsu, NEC and other major Japanese electronics companies have formed a consortium to develop new versions of the free Linux operating system to power future computing devices and also link audio and visual equipment, cellular phones and car navigation equipment. The group is working closely with TurboLinux, one of the top Linux distributors based in Silicon Valley and the largest distributors of Linux in the Far East.

"Coolest computer, ever"

■ **THE COMPUTER INDUSTRY'S** all-time top showman, Apple Computer CEO Steve Jobs again didn't disappoint the thousands of Macintosh faithful at the summer MacWorld show in New York, with a two hour one-man show during which he unveiled a slew of new products from toaster-size PowerMacs to powerful multi-processor machines and a new optical mouse.

Standing under a giant banner that read 'Two brains are better than one', Jobs launched Apple's first multi-processor G4 PowerMac, the industry's first multi-processor general purpose PCs. The machines are designed to take advantage of the long-awaited new operating system, MacOS X, planned for commercial release early next year according to Jobs.

Jobs demonstrated how, in a graphics performance test, the 500MHz dual-processor G4 processors running in tandem easily beat a 1GHz Pentium III to complete a poster. "These machines are wickedly fast, leaving Pentiums in the dust", he said.

Jobs also launched a new line of extremely compact G4 PowerMac 'cubes', white boxes measuring just 200 x 200 x 200mm. These pack a 450MHz G4 PowerPC chip, 20GB of storage, USB ports, a modem, a DVD drive, Ethernet and Airport wireless networking. The G4 cube, which comes with clear tennis-ball sized Harmon Kardon speakers, will be available in the US in early August and sell for US$1799. A 500MHz version with 30GB of storage will sell for $2299. Jobs said they will perform up to three billion calculations per second. The cubes are also completely quiet, as a new cooling system doesn't require a fan.

"The G4 is simply the coolest computer ever", Jobs said, as he showed off the shiny box to an applauding audience.

TSMC completes mergers

■ **ON THE EVE OF** the Semicon West chip equipment trade show in San Francisco, Taiwan Semiconductor Manufacturing Company (TSMC) completed two mergers worth US$7.5 billion — vastly adding to the company's IC output but reducing the customer base for equipment companies in the vital Taiwanese market.

Earlier in January, TSMC said it had agreed to buy the 70% of the TSMC-Acer operation it didn't already control. And last December the Taiwanese company also agreed to take over Worldwide Semiconductor Manufacturing, a rival Taiwanese chip contract manufacturer. Worldwide Semiconductor is a four-year old chipmaker founded specifically as a competitor to TSMC. The company, with financial backing from Winbond, has plants in Taiwan and uses chip technology licensed from Japan's Toshiba.

TSMC-Acer was originally a unit of Dallas-based Texas Instruments. TI sold its 30% stake in the TI-Acer to TSMC in 1999. Following the acquisition by TSMC, Acer is now no longer in the chip-making business.

The new TSMC operation will have a combined annual output capacity of 3.4 million 200mm wafers and expects that to grow to nearly 5 million by the end of next year as new plants come on line.

Oracle launches new Internet computer

■ **THEY COST UNDER US$199**, do not use Windows, plug into a telephone wall outlet and let users connect to the Internet. Oracle's Larry Ellison has now launched the New Internet Computer (NIC), a machine conceived by Ellison in his endless quest to undermine Microsoft and the use of the Windows operating system.

The NIC runs under control of a very inexpensive Cyrix (VIA Technologies) processor and the free Linux operating system. They will give users access to the Internet to send and receive e-mail and surf the Web. Oracle has been giving large numbers of the NIC to schools and is now ready to introduce the machine to the consumer market.

"You plug it into the wall and you can get onto the Internet,'' said NIC Chief Executive Gina Smith said. "Our first target was education, and now we're targeting what I'd call advanced beginner users.''

It is Ellison's second effort at an Internet computer. The first attempt, a US$500 machine marketed by Liberate Technologies, failed to generate consumer interest after it was introduced in 1997. Smith said growing demand for inexpensive Internet access will allow NIC to succeed where Liberate failed. "There are some analysts who think that Internet appliances will outsell PCs in the coming years."

Ellison is chairman of NIC as well as the majority shareholder. Smith is a former commentator for CNET Networks and ABC News.

The NIC sells for US$199, or $328 with a monitor, and another $59 for shipping. The machines are only available from NIC's Web site at **www.thinknic.com**. ea

Cool controller, and mega memory

Friendly fan controller

TelCom Semiconductor have announced two new, easy to use, additions to its proprietary line of fan controllers, the TC650 and TC651. These devices integrate a temperature sensor and a brushless DC fan controller with over-temperature alert in a small 8-Pin MSOP package.

The new pulse width modulation (PWM) fan speed controllers improve system reliability, reduce acoustic fan noise, extend fan life and lower average operating current. The TC650 and TC651 are specifically designed for a variety of modern electronic equipment ranging from notebook and personal computers to set-top boxes and networking equipment.

The TC650 and TC651 drive any standard 2-wire fan through a low cost transistor or logic level MOSFET and provide temperature proportional fan speed control, whereby the fan speed is increased linearly from 40% speed to 100% speed based on a user-programmed temperature range.

These integrated circuits manage fan speed based on the measured junction temperature with a typical accuracy of +/- 2% from 25°C to 70°C. These devices operate from 2.8V to 5.5V and feature a low operating current of 60uA typical. The TC650 and TC651 eliminate the need for additional temperature sensors with the inclusion of an on-chip over-temperature alarm. These user-friendly devices do not require any additional software.

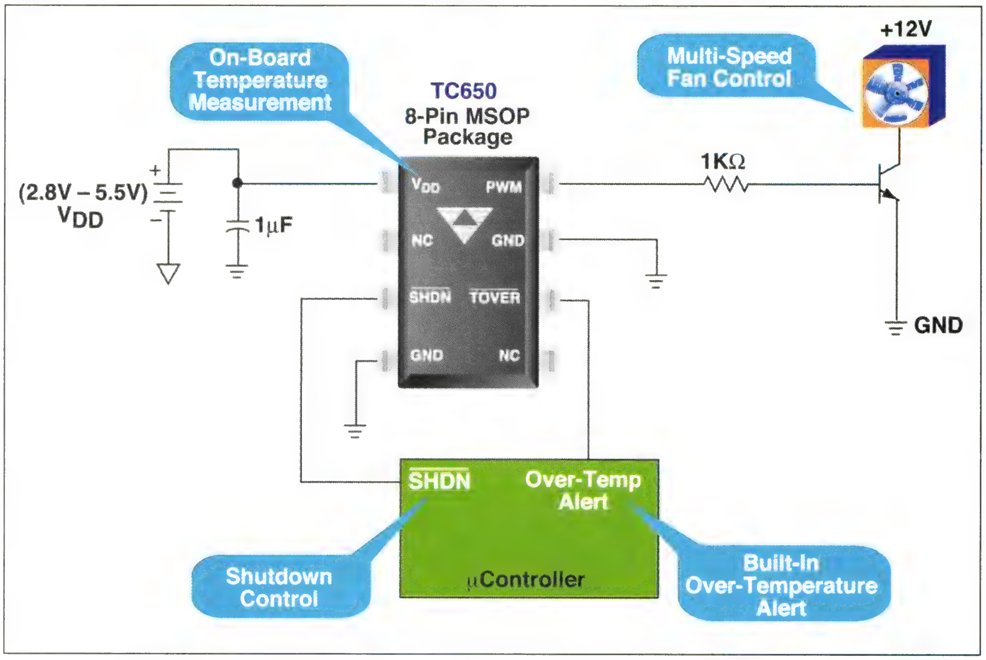
The TC650 also features a minimum fan speed setting functionality, while the TC651 has an auto shutdown mode should temperature fall below the factory set point. The TC650 and TC651 are targeted for a variety of modern electronic applications that use brushless DC fans for forced air cooling. An evaluation kit, product data sheet, and application note information for these devices can be accessed at **http://www.telcom-semi.com/products/datasheets/tc650_1.pdf**.

64-megabit flash memory from Atmel

Atmel Corporation has just released its much anticipated 64-megabit DataFlash memory after keeping details of the device confidential for the past few months.

The AT45DB642, soon to be followed by 128- and 256-megabit devices will allow Atmel to penetrate an entirely new market segment in which the company has not participated in before. With the advent of the AT45DB642, the company plans to become a significant player in the rapidly growing high-density Flash data storage market comprised of applications such as MP3 players, digital cameras, 'smart' cellular phones with internet access, Flash memory cards, palmtop computers, and personal digital assistants (PDAs).

The 64-megabit DataFlash is the world's first dual-interface Flash memory, combining dedicated serial and parallel interfaces into a single device. The dual-interface architecture permits the DataFlash to reside on two distinct system buses allowing efficient interoperability between the DataFlash and multiple processors and controllers. The DataFlash also offers unparalleled functionality with its unique architecture of extremely small page sizes and dual internal SRAM buffers. The DataFlash offers much of the same flexibility of an EEPROM while maintaining the cost advantages of the Flash memory.



"Until now, we've kept quiet about the new 64-megabit DataFlash because it brings quite a bit to the market that our competitors simply can't match," stated Richard De Caro, Atmel's director of marketing for DataFlash. "We worked very closely with customers on defining the features and the architecture of the device, and it appears to have been a worthwhile effort as we have already secured several design wins with the 64-megabit DataFlash." continued De Caro.

The 64-megabit DataFlash is currently implemented on Atmel's advanced 0.25-micron CMOS process and will transition to a 0.18-micron process in 2001. The device is packaged in a small 40-lead TSOP and offered in both commercial and industrial temperature ranges. Current generation devices are designed to operate from a single 2.7-volt only power supply while next generation devices will operate from a single 1.8-volt power supply.

Samples of the AT45DB642 are available now. Pricing starts at US$28.80 in 1,000 piece quantities. ea

Powertech's Cool Dual

Need a flexible and solidly made regulated power supply for your testing or development workbench? The Powertech MP-3092 contains two 0-40V/3A linear supplies in a single case, and able to be used either fully independently or linked as a master and slave for close tracking. Each has dual 3-3/4 digit panel meters for voltage and current monitoring, and both coarse and fine voltage adjustments for easy setting.

By Jim Rowe

A VARIABLE AND regulated bench supply is an extremely valuable instrument for development labs, service workshops and school/college science labs, particularly if it's ruggedly made and able to withstand short circuits. Jaycar's new Powertech MP-3092 should therefore be of interest to a lot of people, as it provides all of this and more.

Made in India, the unit actually consists of two nominal 0-40V linear regulated supplies each rated at 3A continuous output (i.e., 120W + 120W), and able to be adjusted and used either independently or as a master/slave tracking pair. They're housed in a solidly made steel case, with a whacking great power transformer fitted centrally inside and two large finned heatsinks at the back to cool their separate TO-3 regulator transistors. The overall dimensions are 305 x 270 x 135mm (WxDxH), with a weight of about 9.0kg.

Each supply has a pair of 3-3/4 digit LCD panel meters to indicate the output voltage and current, and there are basically three controls for each: coarse and fine voltage controls and a current limiting control. In addition each supply has three LEDs to indicate operating status: a green 'CV' LED to indicate constant voltage mode, a red 'CC' LED to indicate constant current mode, and an orange 'TEMP' LED to indicate when the supply's over-temperature protection circuit has swung into operation.

The output voltage range for each supply is rated at 0 - 41.5V +/-0.5V, with an output current rating of 0 - 3.15A +/-100mA. Rated line regulation for each in CV mode is less than 15mV, and in CC mode it's less than 5mA (for +/-10% mains change). Similarly the rated load regulation in CV mode is less than 30mV, and less than 10mA in CC mode (for 100% load change). The rated maximum output ripple under all conditions is 2.5mV RMS, while the rated accuracy of the panel voltmeters is +/-(0.5% of reading + 1 digit), and that of the current meters +/-(1% of reading + 1 digit).

The MP-3092 has a mains power switch which controls both supplies together, and also a central toggle switch which controls whether the two supplies are operated independently, or in tracking mode – where the left-hand supply becomes the master, and the right-hand one the slave. In this mode the slave's own controls cease to have any effect, and its output closely follows that of the master.

In independent mode there's no ohmic connection between the two supplies, so their outputs can be connected together in series or parallel in order to get higher voltage or current – although you'd need to set their outputs matching each other very carefully, before connecting them in parallel.

When you switch to tracking mode, it's again possible to connect them in series (to provide closely matched positive and negative rails, for example). But only one way around, because the tracking circuitry already establishes an internal link between them from the negative of the master to the positive of the slave; if you try to link them the other way around, you short them out. Similarly you can't connect them in parallel in tracking mode, because of the internal link between the master's positive and the slave's negative.

This means that while the MP-3092's dual supplies are not *totally* flexible in terms of all possible series and parallel configurations, they're still quite good in this respect.

Needless to say as a result of the adjustable current limiting, both supplies are protected against damage due to overload or short circuits – as well as being able to operate as constant current sources when desired. The current controls allow the switchover into CC mode to be set anywhere between about 10mA and 3A, and the easiest way to do this is with a short circuit across the output terminals.

Both supplies seem to be fitted with automatic tap switching on their transformer secondaries, controlled by the supply's actual output voltage. As a result the power dissipation in their regulation transistors is nicely controlled for virtually any output voltage and current level, including into a short circuit.

In short the MP-3092 is not only flexible but rugged as well, at least in terms of specifications.

SUMMARY

■ A well designed and solidly made dual regulated bench supply with two 0-40V/3A outputs.

KEY FEATURES

■ Digital voltage and current meters for each supply
■ Dual voltage adjustment pots for very easy setting
■ Smoothly adjustable current limiting
■ Supplies can be fully independent or slaved

PROS

■ Excellent regulation and tracking performance
■ Cool running, good overload protection
■ Digital panel meters commendably accurate

CONS

■ Very little, really.

RRP

■ $399

AVAILABLE

Jaycar Electronics stores, or from 8-10 Leeds Street, Rhodes NSW 2138; or call 1800 022 888.

What we found

The sample MP-3092 shown in the photo was loaned to us by Jaycar Electronics for a few weeks, allowing us to give it a quite thorough checkout. The results were pretty impressive, too.

Thanks to the dual coarse and fine controls we found it very easy to set the output voltage of either supply to anywhere from 0V to 40.96V, which was the sample's maximum in each case. It wasn't quite as easy to set the current levels because of the single controls, but still relatively easy to set them anywhere between about 30mA and the maximum of 3.12A. In both cases the job was made much easier by the digital voltage and current panel meters, of course.

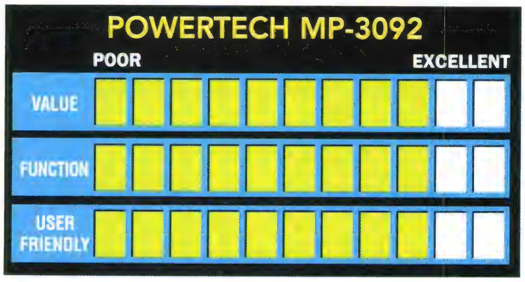
The measured line regulation figures were well within specs, at 10mV and 3mA respectively for CV and CC modes. Similarly the load regulation measured just on 29mV at the 40V output level and only 6mV at the 10V level (3.0A load in each case). The output ripple level measured only 1.2mV RMS with no load, rising to only 1.4mV RMS at 3.0A.

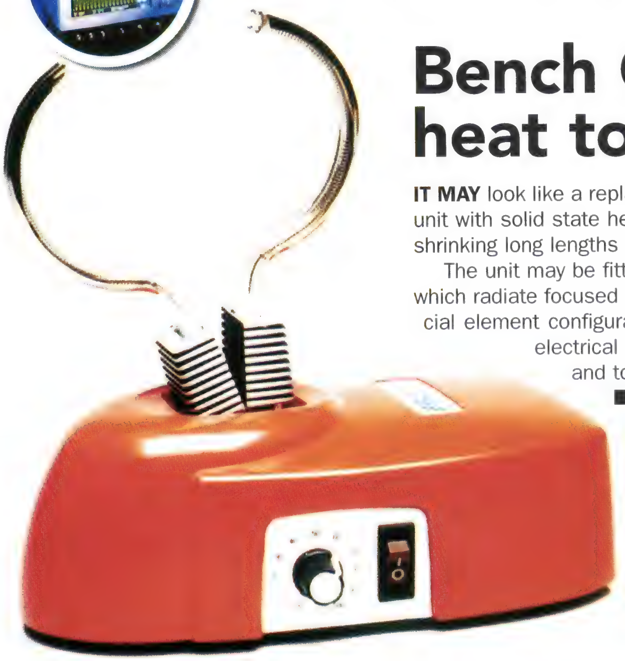
The measured accuracy of both sets of panel meters measured within one LSD count, which is again comfortably within spec and should be accurate enough to avoid the need for checking with a DMM, in most applications.

Although the master-slave tracking is not specified, we measured this at both no load and full load, and obtained figures of better than +/-25mV at all voltage levels. This should be close enough for all except the most demanding uses.

Just for the record we also tried running the supplies at full rated current into short circuits, and found that the temperature rise of the pass transistor heatsinks was relatively modest even after five minutes. Since the supplies have over-temperature protection in any case, this suggests that they have ample ruggedness for most likely applications – including school and college practical lab benches.

In short, then, the Powertech MP-3092 seems a well designed, solidly made and conservatively rated unit. It's competitively priced, very convenient to use and should be a good choice for any application needing a dual tracking bench supply with these ratings. **ea**





Bench Glo-Ring infrared heat tool

IT MAY look like a replacement robotic hand, but the Glo-Ring is, in fact, a single element bench unit with solid state heat controls for shrinking long lengths of heat shrink tubing. It is ideal for shrinking long lengths of shrink tubing on cable assemblies and wire harnesses.

The unit may be fitted with 1/2", 1 ", 2" or 3" diameter gold plated plug-in quartz elements which radiate focused infrared heat on the work piece at temperatures of up to 815°C, and special element configurations are available. Heating elements open and close by activating the electrical foot switch, while the quartz elements are protected by guards for safety and to prevent accidental damage.

■ *For further information on the Single Element Bench Glo-Ring or other Infrared Heat Tools, contact The Eraser Company via their website at www.eraser.com.*

DC/DC power modules boast 92% efficiency

THE ERICSSON Energy Systems PKJ family of 'half brick' DC/DC converters has been extended with nine new models offering 15A, 20A and 30A ratings in both 2.5V and 5V versions, and 75W, 100W and 150W at 12V. Full power is guaranteed at up to 100°C case temperature, and although no heatsink is required thanks to the high efficiency (92% at 12V, 12.5A), an optional heatsink is available to provide flexibility in meeting low airflow, high ambient temperature or extended reliability requirements.

With a load transient recovery time of 50us, only 75mV p-p ripple and with further products planned for 1.8V and 1.5V output, the PKJ is firmly aimed at next generation systems requiring a flexible, high density DC/DC converter in an industry standard package.

■ *The PKJ is the first family of products designed and manufactured in the USA at the new Richardson, Texas design centre of Ericsson Energy Systems and is available internationally through Ericsson's global design centre.*

IBM's 1GB MicroDrive

IBM is tripling the capacity — but not the size — of the world's smallest hard disk drive, paving the way for a new generation of 'go-anywhere' pervasive-computing devices and applications.

Packing one gigabyte of data storage capacity on to a disk the size of an American quarter, IBM's newest Microdrive can hold up to 1,000 high-resolution photographs, a thousand 200-page novels or nearly 18 hours of high-quality digital audio music.

The 1GB Microdrive brings affordable high-capacity, high-performance data storage to a wide variety of handheld electronic products — including digital cameras, handheld PCs, personal digital assistants (PDAs), portable Internet music players and video cameras.

It can also serve as a data-exchange accessory to notebook computers, desktop computers and printers. Future applications may include wearable computers, electronic books, global positioning system (GPS) receivers, smart phones and electronic wallets.

"Using the new Microdrive, a company's entire multimedia product catalog can be carried around in a shirt pocket," said Michael Kuptz, director, IBM Microdrive Products.

"Such vast capacity in such a compact size will dramatically change the way information technology and consumer electronics devices are designed and used, helping accelerate the worldwide adoption of pervasive computing."

■ *Back in 1980, IBM introduced the 3380; the world's first gigabyte-capacity disk drive. It was the size of a refrigerator, weighed around 250kg and cost $40,000.*

The new Microdrive is smaller than a matchbook, weighs less than an ounce and will be available for less than $500. For more information about the IBM Microdrive, visit: www.ibm.com/storage/microdrive.

Digital recorder handles nine cameras

MITSUBISHI has incorporated some of the most advanced digital recording features into its new DX-TL900E digital time lapse recorder. The unit realises high-resolution playback of over 400 horizontal lines thanks to digital technology using JPEG compression.

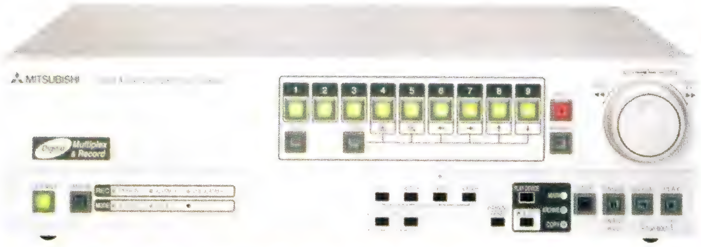
As multi-camera systems become increasingly popular, integrated recorders and multiplexers are now standard. The DX-TL900E incorporates a versatile nine-camera input multiplexer that can perform backup and copy operation without interrupting recording. Backup media can be chosen from DDS, DVD-RAM or MO.

Its camera switching and split screen display allows up to nine cameras to be connected for non-simultaneous throughput, and watch camera feeds from 1, 4 or 9 cameras on split screen sequential playback. The DX-TL900E also features a built-in, large volume 10-Gigabyte hard drive for high reliability and high-speed operation.

When close ups on crucial areas of security, like cash registers or other point of sale points are needed, this model features an electronic zoom function.

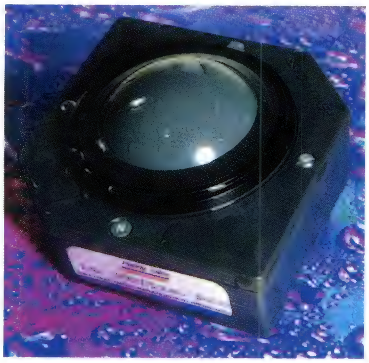
The DX-TL900E also features a watermarking system designed to safeguard images from being tampered with, which clearly indicates when images have been altered.

■ *If you want to keep a digital eye on nine things at once, contact Mitsubishi on (02) 9684 7777 for more information, or visit www.mitsubishi-electric.com.au.*



Industrial Trackerballs

PENNY & GILES Computer Products has produced a new range of 50mm diameter trackerballs aimed at the industrial, medical and military markets.



The trackerballs incorporate a new design using PTFE coatings with the end result being a very smooth seal without the stickiness normally associated with dust-proof trackerball designs. A full range of interface options is available including RS-232 and TTL data stream.

■ *For further information on any Penny & Giles Computer products contact Control Devices on (02) 9356 1943.*

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☑ 10A fused

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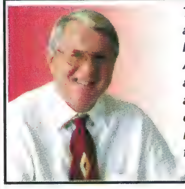

Thanks to all our customers who contributed ideas and suggestions for the new 2000/2001 catalogue. I think you will agree the result is outstanding. Also, you may like to explore our new "Virtual Store" at www.altronics.com.au which offers these specials and more 24 hours a day! To celebrate the launch of our new site all purchases over $100 made via the internet site will include a bonus $10.00 gift voucher for you to use with your next purchase with us.

Jack O'Donnell, Managing Director

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- •Includes 18V DC Plugpack.

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Security Door Strike

Suits S 9400 Video Intercom System

Install this door strike as a gate lock or in your front door and be able to "Buzz" in your visitors. Suitable for use with security doors, building entrances or exits or external gates.

Automatically open your gate from in the safety of your home.

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Complete and concise electronics information all in a pocket sized reference. Easy look up tables, formulas and diagrams take the place of lengthy text descriptions making this the perfect quick reference for students, hobbyists, teachers and technicians. 532 pages

An ideal study aid for students!

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- Pre trigger

Q 0148 Only **$399**

LAN Cable Tester

The quick and easy way to test field wiring. Simple operation will save you hours of frustrating fault finding.

An absolute must for computer techs & installers!

Features:

- Auto/Manual mode
- LED indicators for all connections including Ground
- Will test 10Base-T, 10Base-2, RJ45/11, 258A, TIA 568A/568B and Token Ring
- BNC to RJ45 Adaptor lead included
- RJ45 to RJ45 Adaptor lead included
- Includes Soft carry case

D 3007 Was $119 NOW ONLY **$99**

Wireless Colour AV sender

Transmits and receives a colour video and stereo audio signal up to 50m. Transmit a video signal to another television or simply use one of these to make your security camera cable free.

Features:

- Includes transmitter, receiver and power supplys
- Standard RCA connections
- Compact transmitter unit can fit just about anywhere
- Compatible with any video signal , i.e. Laser disc, VCR, CCD, Cable TV.
- Stereo audio
- Clear signal anywhere up to 50m

S 9350 Only **$199**

Infra-Red Mouse

Install this infra-red mouse and be un-hindered by computer cable tangles!

Features:

- Simple to install
- 2 Scroll wheels (Up/Down & Left/ Right)
- Compact easy to install receiver
- Wide (160°) Operating angle
- Third button control
- Cable free
- Microsoft Windows® 3.1/NT/ 95/98 compatible
- Automatic battery save mode
- Complete with software

D 2065 Only **$49.95**

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Features:

- Black textured powdercoat finish
- Aluminium & steel construction with removable top and bottom panels
- All dimensions conform to International Standards
- Ventilated lid
- Deluxe finish front panel
- Available in either 1U or 2U size

Made

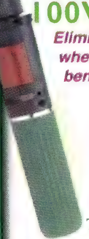
All new modern design featuring a recessed bevelled front panel!

H 5035 1U (44mm) Only **$99**

H 5036 2U (88mm) Only **$119**

100W Gas Soldering Iron

Eliminate the need to run extension leads whenever you have to solder away from the work bench *Features:*



- Butane gas powered
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- Quick heating tip
- Ideal for automotive work, lead lighting, silver soldering or brazing

No wire tangles! Great for soldering in awkward places

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Features:

- Four programmable buttons • Easy to program
- Wide operating frequency range of 255-500MHz
- Includes alkaline battery
- Includes key ring

Suitable for use as a replacement for your car alarm remote control or combine several remotes into one.

A 1015 Was $41.95 Now **$35**

Programmable Remote Control

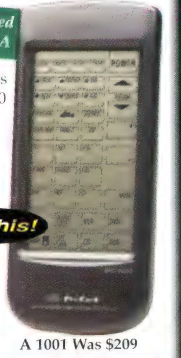
as featured in Sept EA

Very simple to program and operate. Replaces up to eight remote controls plus adds up to 10 one-touch macro functions for armchair comfort. ***Features:*** • Auto power save

- Useable with all modern AV equipment (e.g. DVD) • Stylish touchscreen display
- Adjustable Backlit display
- Smart and easy to programme.

Consolidate several remotes into one! From this...

...to this!



A 1001 Was $209 NOW **$199**

WATER-PROOF Bullet Style CCD Cameras

Ideal for use outdoors, in humid or water logged environments.

Features:

- Internal regulation, requires standard 9V DC supply (M 9236 $14.85)
- •Compact & durable housing (Size: 22Ø x 61mm)
- •Includes swivel mounting bracket
- •Waterproof to 5m
- 380 lines resolution (S 9085) B/W
- 330 lines resolution (S 9135) Colour

S 9085 Black and White , Only **$175**

S 9135 Colour , Only **$270**

2 Channel 6" B/W Monitor

Monitors up to two CCD cameras and switches between them automatically

Why rent a monitoring system? Purchase one and save $$$ each month

- •May be configured to automatically switch between two A/V inputs
- Manual override capability for monitoring a single input continuously.
- •Variable switching interval
- •Video and audio outputs are provided for a recording VCR
- •DC output for powering CCD cameras with internal voltage regulation.

S 9090 Only **$135**

19 Range DMM with backlight

Small enough to fit into a pocket, yet versatile enough to use on just about any job. Includes a backlit display for jobs in poorly lit areas.

Features:

- Range hold & data hold • °C Temperature range • AC < 400mV - 600V
- DC Volts < 400mV -600V
- Resistance < 400Ω - 40MΩ • Continuity buzzer
- AC/DC current < 400μA - 10A
- Transistor tester • Diode check • Rubber holster included

Q 1126 Only **$29.95**

Incredible 3 Year Warranty!

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ALTRONICS

Flameless Heatgun

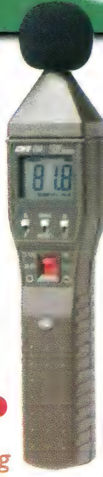
Reduces heatshrink quickly and effectively without burning it!

Features: •Regulated flameless heat output •Powered by a refillable gas cartridge •Trigger-actuated piezo electric starter •Safety lock to prevent accidental ignition •Compact and stylish

This month Buy the T 2480 and receive a BONUS W 0880 Hobby Heatshrink Pack Valued at $15.75 at no extra charge!

T 2480 Only **$36.50**

DIGITAL SPL Meter



Provides a digital readout of the ambient noise level in a room or vehicle so that AV gear may be positioned within the room to obtain the best possible result.

Features

- Two ranges: **Low** (35 to 90dB) and **High** (75 to 130dB),
- A and C weighting.
- Slow, Fast,and Max Hold
- AC and DC signal output for data analysis and recording
- Self-calibrating.
- Complete with protective carry case, tripod mounting adaptor and mic wind screen.

Ideal for tradesmen,installers and serious audiophiles

Q 1262 Only **$260**

Thunderous Subwoofers

AMAZING TWO FOR ONE OFFER! Buy one of these fabulous subwoofers and get another one of equivalent value FREE! That's up to $155 worth of extra value.

Not only do these sound sensational, they look sexy too!!

The polypropylene cones which are mirror finished will not flex or distort under high power use. They are specially designed for small sealed or vented enclosures.

C 3048 120W 8"	**$105**
C 3050 150W 10"	**$115**
C 3052 200W 12"	**$155**

Ideal for use in a car for a punchy addition to your stereo system.

Ultrasonic Cleaner

Rejuvenate your jewellery or clean your pen nibs, fuel injectors, glasses, watches PCB's, computer connectors, switches or relays.The ultrasonic cleaner restores delicate items to the new shine without the need for nasty solvents.

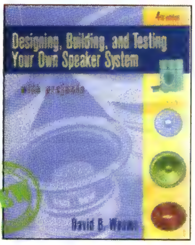
New Improved model!

A 0102 Only **$239**

Features:

•170x 90 x 55mm stainless steel tank with a capacity of 600mls.•Cleans without scratching delicate jewellery or glass •Auto power off •Uses water and household detergent •Compact design

Designing, Building & Testing your own Speaker System



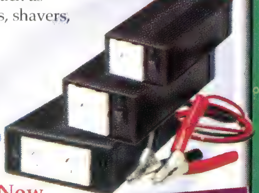
Aids in the design, construction and testing of speaker systems, this book is a complete reference to building speakers. It covers all the latest types and models of speakers and is aimed at electronic hobbyists, do-it-yourself audiophiles and electronic technicians. It contains comprehensive source code for a speaker design program. 223 pages.

NEW

B 2425 Only **$46.15**

Mains Power ANYWHERE ANYTIME!

These inverters will generate 240V AC power from your car battery! Powers appliances such as televisions, VCR's, incandescent lights, shavers, power tools, etc.



Features: • ±10% regulation, modified square wave output • 90% Efficiency
•Thermal and overload protection
•Compact and lightweight
•Audible Low Battery Alarm & Shutdown
•High Surge Capability
•Fan cooled

	Was	Now
M 8110 140W Inverter	$152.95	**$99**
M 8115 300W Inverter	$250.95	**$149**
M 8118 600W Inverter	$408.45	**$249**

Hurry , limited stock 50 of each model only at these insane prices!

2 Way High Performance Hi-Fi Speakers

Offering a stylish contoured profile, these 2 way 8 ohm high performance speakers both look and sound sensational. The 'bookshelf' series is a 30W, compact pair of speakers making them ideal for un-obtrusive surround speakers.
The 'monitor' series are 40W speakers with a larger woofer making them ideal for a set of patio or under eaves speakers. Available in either black or white

'Bookshelf' series deal.

Purchase a pair of either the C 0900 or the C 0901 bookshelf series speakers for only $135 and receive a 30m roll of W 2120 speaker cable (valued at $18.00) absolutely free.

'Monitor' series deal

Purchase a pair of either the C 0910 or the C 0911 bookshelf series speakers for only $260 and receive a 30m roll of W 2120 speaker cable and a A 2300 Stereo level controller absolutely FREE!, that's $63.00 extra at no extra cost!!

C 0900/ C 0901 'Bookshelf' series deal
Only **$135** per pair
+ free cable

C 0910/ C 0911 'Monitor' series deal
Only **$260** per pair
+ free stereo level control and free cable

20MHz Dual Trace 4 Beam Oscilloscope

With the increasing complexity of electronic circuits a high quality oscilloscope is an absolute necessity for service techs & serious enthusiasts alike.

Features: Wide bandwidth and high sensitivity • Very low power consumption • High sensitivity X-Y mode • Z axis (intensity modulation) • Simultaneous display of original and magnified waveforms on each input • Front panel electrical trace rotator • Regulated power supply circuit for accuracy • TV video sync • High frequency rejection filter in the triggering circuit

FREE CRO & PROBE OFFER
Purchase the Q 0150 this month for $749 and receive a Q 0174 CRO probe valued at $41.50 at no extra cost.

Allows Simultaneous display of original and magnified waveforms!

Q 0150 ONLY **$749**

KITS

Power Supply Kit

NEW in '2000

(SC July. '2000) Suitable for use as a bench top/ Laboratory power supply. Supplied in a rugged steel case. See website for full details.

K 3250 **$149.95**

Mixture Display Kit

(SC September. '2000) .Displays the fuel/air ratio of an engine. See website for full details.

NEW in '2000

K 4347 **$64.95**

PC Powerup Kit

(EA August. '2000) .
Powers up your monitor and other devices when your computer powers up
See website for full details.

NEW in '2000

K 2870 **$34.95**

100w Amplifier Module Kit

Build this 100W low distortion amplifier module.
See website for full details.

NEW in '2000

K 5150 **$89**

Loudspeaker Protection Kit

(SC Aug. '2000) Protect your valuable speakers from overload with this easy to build protection kit.
See website for full details

NEW in '2000

K 5055 **$39.95**

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***Overnight Jetservice:** Up to 3kg is $11, 3kg to 5kg is $18.00—We will process your order the day received (if placed before 2.00PM WST) and despatched for delivery the next day. Country areas please allow an additional 24-48 hours. Not available to PO boxes.

Heavy Service: All orders of 10kgs or more must travel Express Road—Please allow up to 7 days for delivery. $13.20 to 10kgs. $16.50 over 10kgs.

Insurance: As with virtually every other Australian supplier, we send goods at consignee's risk. Should you require insurance cover against loss or damage please add $1.00 per $100 of order value (minimum charge $1). When phone ordering please request "Insurance".

Altronics Resellers: Chances are there is an Altronics Reseller right near you—check our catalogue or phone us for details of your nearest dealer. An up to date reseller listing is available at our internet site at www.altronics.com.au 24 hours a day.

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Universal photoelectric sensor

BANNER ENGINEERING has introduced the World-Beam, a new universally mountable photoelectric sensor that measures only 35 x 15 x 31mm. Because its single housing style fits almost all mounting requirements, the World-Beam can replace hundreds of existing sensors, meet or exceed their performance, and take up less space.

The unit features an 18mm threaded nose to directly replace 18mm diameter barrel sensors. The standard mounting hole configuration also allows direct replacement of numerous non-threaded rectangular sensors.

The World-Beam sensor also features versatile output configurations and self-diagnostics. Users can choose complementary NPN (sinking) or PNP (sourcing) outputs, one normally open and one normally closed, each capable of switching up to a 100mA load. LEDs indicate 'Power On' and 'Output Status', as well as output overload condition and marginal signal. The sensor delivers increased sensing productivity in low and high volume applications.

■ *For further information, please contact Micromax Pty Ltd., on 1300 362 626.*

Clad molybdenum wire for high temperature applications

ANOMET PRODUCTS has introduced metallurgically-bonded platinum clad or nickel clad molybdenum wire for high temperature applications where oxidation- or corrosion-resistance is required.

Featuring smooth, consistent surface finishes, Anomet Platinum Clad- and Nickel Clad Molybdenum Wire is available in sizes from 0.1mm to 1.5mm dia. with typical claddings ranging from 10% to 30% weight. Formable and bendable, they can be provided in straight lengths or spooled.

■ *For more information, contact Anomet Products at anomet@aol.com.*

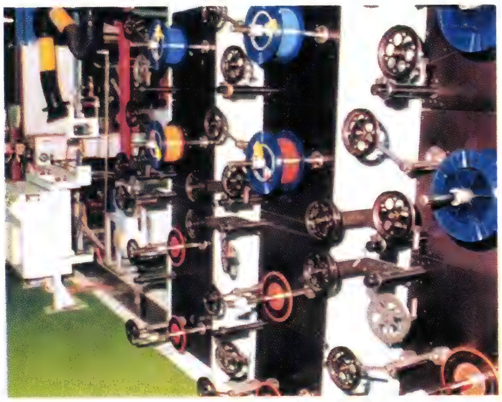
Aussie Fibre

BELDEN AUSTRALIA has introduced Laser Certified Fibre (LCF) optical fibre cable, which is compliant with new laser systems and will ensure compatibility with future technology.

To be manufactured at Belden's plant in Tottenham, Victoria, the cables will handle the new light sources required in short wavelength gigabit Ethernet systems. These new light sources, called VCSEL (Vertical Cavity Surface Emitting Lasers) are designed to operate at the short wavelength of 850nm, the same wavelength as today's LED light sources.

Belden's LCF internal/external riser cables are local area network distribution backbone cables that provide high bit-rate communication between mainframes and building distribution systems. They have a dual-layer UV-cured acrylate coating that provides excellent fibre protection and strips cleanly and easily.

■ *For more information call Belden on 1800 500 775 or go to www.belden.com.* **ea**



ea
Subscription offer

Win one of 10 Pioneer stereo systems!

Subscribe to *EA* this issue and not only will you receive 12 issues at the discount price of $64, but you will also be entered into the draw to win one of 10 Pioneer stereo systems, valued at $429!

Features include:
- 24-program CD player
- 24-preset AM/FM radio
- Programmable sleep/wakeup timer
- Auxiliary input; multipin MiniDisk connector
- Four 'tone' settings. Power bass function.

Made up from three small (145 x 137mm) cubes, the Happy Tune is a stackable CD/receiver system designed to easily fit into bench spaces and shelves!

For more information, call Pioneer's toll-free consumer information line on 1800 060 052, or check out the Pioneer Australia website at: http://www.pioneeraus.com.au

Pioneer

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CONDITIONS OF ENTRY: 1. The competition is open to Australian residents authorising a new or renewed subscription to Electronics Australia magazine. Employees of PMG, Pioneer, their subsidiaries and families are not eligible to enter. 2. Prizes are not transferable or exchangeable and may not be converted to cash. 3. The judge's decision is final and no correspondence will be entered into. 4. The competition commences on August 21, 2000 at 9am and closes last mail on September 26, 2000. 5. The draw is at the promoter's premises on October 4, 2000 at 11 am and the winner will be announced in The Australian, issue date October 6, 2000 and notified by mail. In the event of any unclaimed or unwanted prize, a second chance draw will be conducted on February 4, 2001 subject of Reg. 37 of the Lottery & Gaming Regulations 1993 (SA). 6. The prize is one of 10 CD players from Pioneer, valued at $429 rrp each. 7. Total prize value $4290 rrp. 8. The promoter is FPC Magazines, 180 Bourke Road, Alexandria, NSW 2015. 9. All entries become the property of FPC Magazines, and may be used for future marketing purposes. NSW permit No. 00/6529; ACT permit No. TP99/4969; SA permit No. T00/2544; NT permit No. NT00/2466.

Hurry! Offer ends September 26, 2000

Yes, I want to subscribe to EA and go in the draw to win one of 10 Happy Tune stereos.

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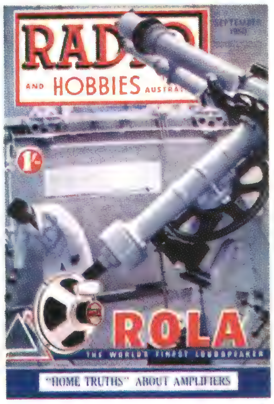
ELT-CDP-09/00

HISTORY & CROSSWORD

Published since 1922, **Electronics Australia** is one of the longest-running technical magazines in the world. Here are some interesting items from past issues:


RADIO AND HOBBIES
ROLA
THE WORLD'S FINEST LOUDSPEAKER
"HOME TRUTHS" ABOUT AMPLIFIERS

50 YEARS AGO

A telephone in your car: Sydney is the first Australian city in which, for the cost of the necessary equipment and payment of the required fee, you can have a telephone installed in your car, and talk to your friends within a radius of 20 miles or so of the city. The PMG has now opened a radiotelephone service, and already several cars have been licensed to carry their own telephones.

The telephone operates just like a normal handset except that a "Press to Talk" lever is squeezed by the fingers when speaking – released when listening. The handset clips into place on a small control panel, when not in use.

Britian's helicopter air buses: British helicopter experts are making plans for inter-city air buses in five years, according to our London correspondent. Their activity foreshadows inevitable development of short haul air traffic which can cope with restricted landing spaces.

The world's first regular passenger service by helicopter began recently between Liverpool and Cardiff a major step forward in plans for air-buses travelling between city centres.

The service is conducted by British European Airways.

With the possibility of intercity travel in these air buses of the future coming nearer much may depend on how the first regular helicopter passenger service "catches on".

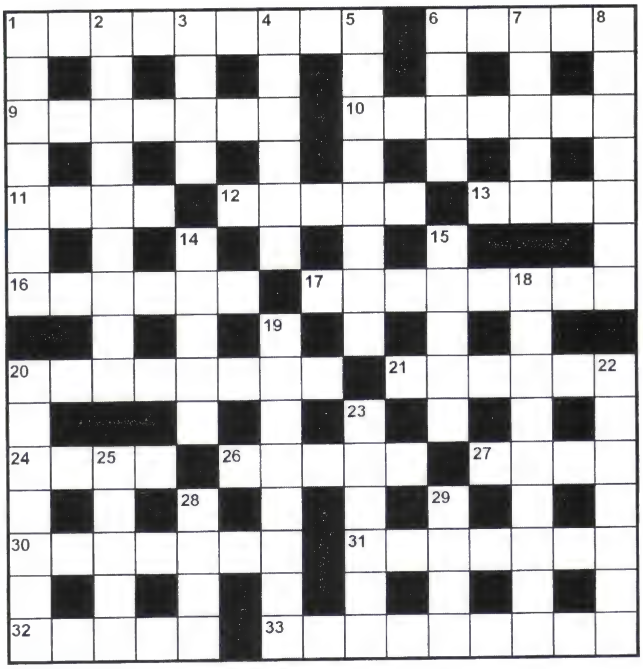
25 YEARS AGO

Digital watch prices set to tumble: Time is marching on, but the sounds of its progress may be getting fainter. If the recent history of the mushrooming popularity of the electronic calculator is any guide, then the electronic digital watch may soon silence the tick-tock coming from many wrists.

Right now, the prices for solid state digital watches range from under $100 up to $300, but as the production processes are made more economical the cost is expected to drop quickly, as it did for the electronic pocket calculator.

Flywheel-powered vehicles: Stanford Research Institute researchers are working on a device that they believe may replace gasoline for most urban driving within 15 years. The device is a flywheel – a wheel that stores up energy by continuing to rotate for some time after it is brought up to a speed.

Since about three-fourths of all urban driving is accumulated in short hauls, such a hybrid system would greatly reduce gasoline consumption (and air pollution) in urban areas. ea



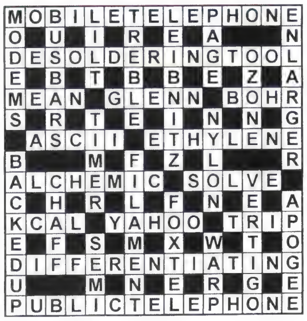
ACROSS

1 Device able to convert light to electricity. (5,4)
6 Set ready to operate. (5)
9 Magnetic coupling. (7)
10 Discoverer of the electron. (7)
11 Small comprehensive integrated circuit. (4)
12 Vertical measurement. (5)
13 Standard of measurement. (4)
16 Zero. (6)
17 Fine-tuned; trimmed. (8)
20 Object capable of resonance. (4,4)
21 Rods used in conducting. (6)
24 Said of certain induced emf. (4)
26 Wash a gas. (5)
27 Type of antenna. (4)
30 Early movies with audio had this name. (7)
31 Device that forms graph, etc. (7)
32 Floppies. (5)
33 Positions on stationary waves. (9)

DOWN

1 Element in the Carbon periodic group. (7)
2 Angular measure found by GPS. (9)
3 Term indicating extended mobile phone area. (4)
4 Number of ones? (6)
5 Angular measure found by GPS. (8)
6 Elementary particle. (4)
7 Sub-atomic particle. (5),
8 Transferred. (7)
14 Type of noise. (5)
15 Concerned with the Moon. (5)
18 Said of certain modified filaments. (9)
19 The x-coordinate. (8)
20 Revolved around a planet. (7)
22 Round objects. (7)
23 Information or signal delivered by a device. (6)
25 Initiates use of a telephone. (5)
28 Set threshold value. (4)
29 Given name of Bardeen, co-inventor of transistor.(4)

AUGUST SOLUTION



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E	■	F	■	S	■	M	■	X	■	W	■	T	■	O
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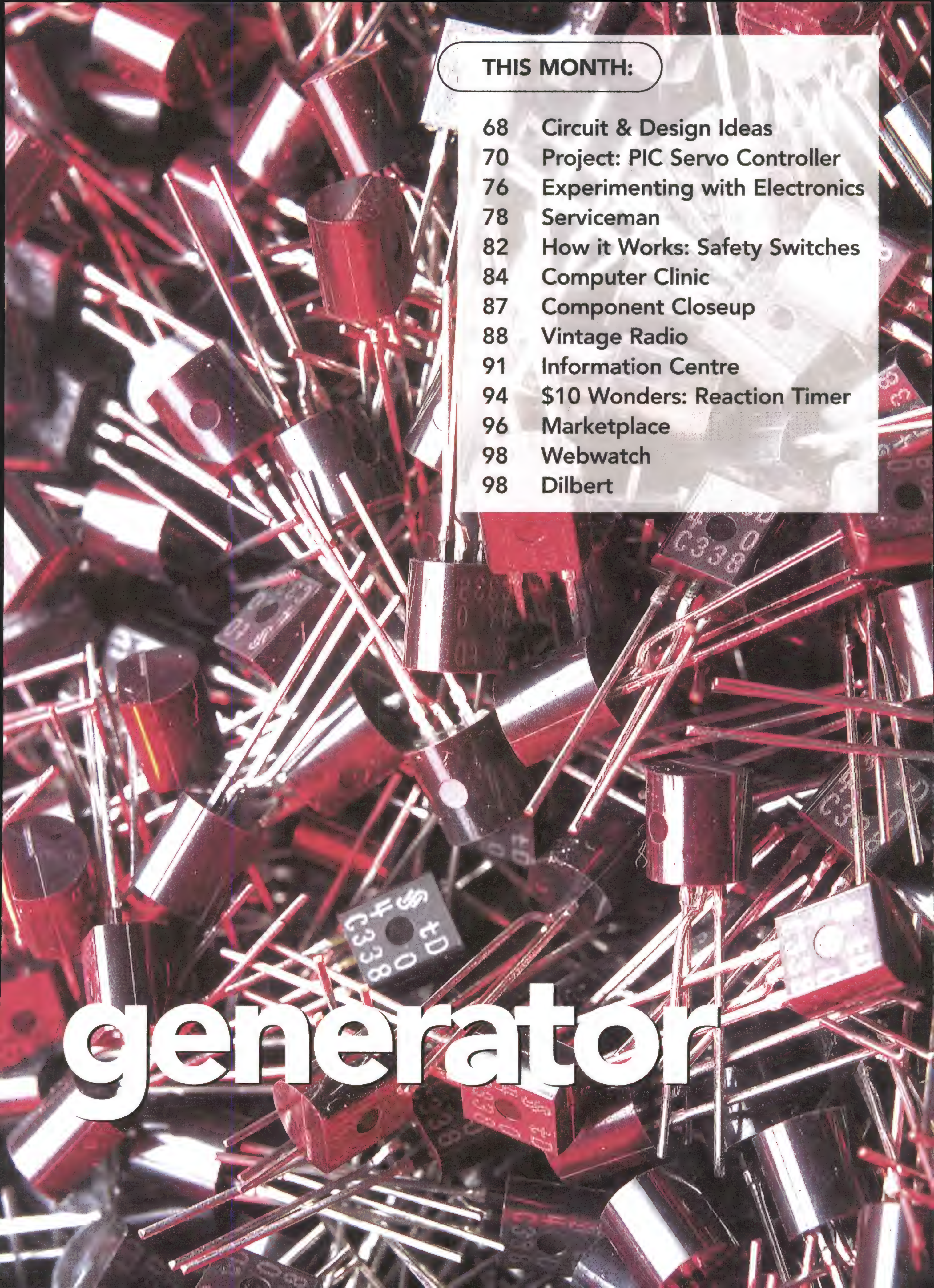


THIS MONTH:

68 Circuit & Design Ideas
70 Project: PIC Servo Controller
76 Experimenting with Electronics
78 Serviceman
82 How it Works: Safety Switches
84 Computer Clinic
87 Component Closeup
88 Vintage Radio
91 Information Centre
94 $10 Wonders: Reaction Timer
96 Marketplace
98 Webwatch
98 Dilbert

generator

CIRCUIT & DESIGN

THIS MONTH'S WINNER!

Globes flasher for the festive season

FLASHING LIGHTS used for festive seasons normally have one thermal flasher globe, where the bimetallic device in this globe switches the rest of the globes on and off. A thermal bimetallic device is mechanical in design, and quite often it fails just when you need the lights to work. When it fails, all the globes are either off or remain permanently switched on (do not flash).

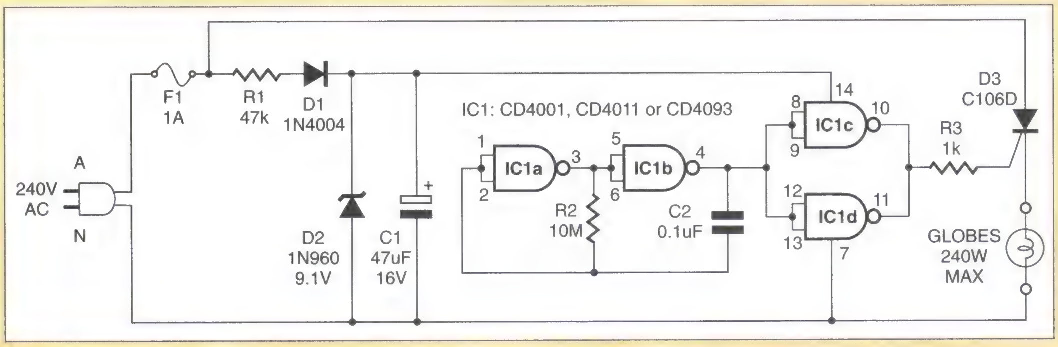
The rescue is the solid state device shown here. This device runs off the incoming 240V AC power without the use of a power transformer, and as a result is highly reliable, consumes little power and can be built with a compact footprint. However, a great deal of care must be taken when working on this design, since 240V is applied directly to the circuit without isolation. Fuse F1 is also used for safety reasons.

IC1 is a quad gate device. As all gates in IC1 are only used as inverters, a quad NOR gate (4001) or a quad NAND gate (4011, 4093) CMOS device can be used here. IC1a and IC1b are configured as an astable multivibrator, with its sequence (duty cycle) derived from the values of R2 and C2. High resistance and low capacitance values have been chosen - as opposed to a low R and high C - to keep the components small, and to help the circuit's reliability and stability. IC1c and IC1d are also configured as inverters, and act as buffers to increase the output drive current.

The power source for IC1 is derived from the AC mains via resistor R1 and rectifier diode D1. Zener diode D2 maintains a stable supply of 9 volts, and capacitor C1 smoothes out the remaining 50Hz ripple.

The output of IC1c and IC1d triggers the sensitive-gate SCR diode D3 via resistor R3. The circuit will work only on resistive loads, and operates on half of the incoming waveform - therefore the brightness of the globes is reduced by half.

Michael Ong Yong Kin
City Beach, WA **$30**



ea Circuit and Design Ideas entry form

Use this form when sending in your Circuit and Design Idea (CDI) submissions and you'll stand the best chance of your entry being chosen, or better still, selected as our 'Idea of the month' prize winner!

Remember, this is also a forum for reader's design ideas, so the entry doesn't necessarily have to include a schematic diagram, or even be based on a circuit. So if you have an interesting electronics-related design or idea, send it in - you could have your contribution published, and profit from it too!

Send to: ***Circuit and Design Ideas Editor, Electronics Australia, PO Box 199, Alexandria NSW 1435;*** or Fax to: ***(02) 9353 0613***

Attached is my Circuit and Design Ideas submission.

Name . . . .

Address . . . . Postcode/ZIP . . . .

Country . . . . Phone . . . .

Email . . . .

CDI submission title . . . . Date of submission. . . . .

While we will certainly consider CDI entries that do not include this form, we strongly encourage readers to fill in the above information and send it along with their submission. It helps our filing system so we're less likely to loose your entry, and it makes sure that you include essential information such as your postal address - we can't send you a prize if we don't have that!

If you don't wish to cut up your magazine, make a photocopy of this page and fill that in, or just include the above details on a separate sheet of paper. Emailed CDI submissions should also include your details, preferably laid out as above.

CDI entries must be original, not previously published, and not concurrently submitted to other magazines. We consider all CDI entries, but cannot guarantee that yours will be selected for publication. **ea**

IDEAS

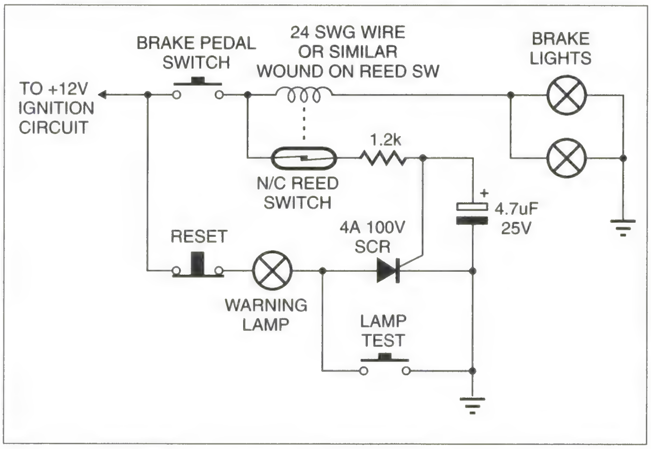
Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

IDEAS FOR EXPERIMENTERS

Car lamp failure warning

Many car lamp warning circuits only indicate a lamp failure during the time it's meant to be on. For a stop lamp, this would be while the brake pedal is pressed - at time when you're not (or shouldn't be!) checking the status of warning lights.

However, this circuit will 'latch on' to show that the brake lights are faulty. Even if the fault is intermittent - as is often the case with wiring faults - the circuit will effectively remember that a fault has occurred, and stay in this state until manually reset.



The current in the brake lights is sensed by a coil of enamelled copper wire that is wound onto a normally-closed (N/C) reed switch. The correct number of turns must be found (by experiment) that will open the reed switch contacts when both lamps are working.

If either of the lamps should fail the switch contacts will remain closed, triggering the SCR via the 4.7k resistor. This then holds the Fail lamp on until the circuit is broken by the reset switch. The 4.7uF capacitor prevents false triggering, and the 'lamp test' switch allows you to check that Fail lamp is intact.

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As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a Video Inspection Capture System from Allthings Sales & Services, which consists of a colour CCD camera, close-up lens set, adjustable stand and lamp, PCI video capture card and software, plus video cable and two plugpacks. You can find out more about this great system at the Allthings website; www.allthings.com.au.

Pumping up the Powerup

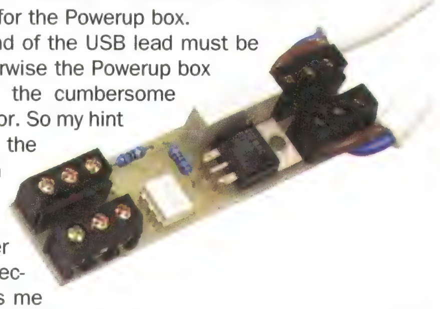
I BUILT UP the PC Powerup from the August issue of EA, and it works like a treat. However I made a few improvements and changes along the way, and these may interest other readers.

The circuit uses a MOC3021 triac opto isolator, but when buying the parts in my local electronics store I realised that the zero-crossing version (MOC3041) was available at only a slight increase in cost. This is directly compatible with the standard type, and has the same driver LED current requirements.

I have sensitive equipment around my PC, and using the more sophisticated opto-isolator ensures that the Powerup will only switch at the mains zero-crossing point, therefore generating the least possible electrical interference.

My unit was based on a USB cable, like the one shown in the original article, and I realised that exactly where you cut that lead (to 'insert' the Powerup circuit) can be important. In my case the PC box is on the floor but my USB scanner in on the table near the screen and keyboard - and since the 240VAC wall outlet is near the PC, this is the logical place for the Powerup box.

This in turn means that the PC end of the USB lead must be short and the scanner end long, otherwise the Powerup box will end up hanging in mid-air with the cumbersome mains cables dangling down to the floor. So my hint is, think twice when you're cutting the USB or keyboard lead to be used with the Powerup.



The other change I made was to use a standard 4-way mains power board with the unit, rather than the specified extension cord. This neatly gives me enough 240VAC outlets to run all of my PC's outboard gear, and while the mains lead itself is much shorter than an extension cord, the length suits my setup well.

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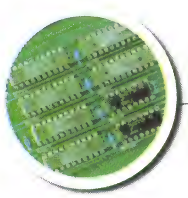


BY ASHLEY ROLL

PIC-based
Serial Port Servo Controller

Ever wanted to use servos in a robotics project? This project uses a PIC microcontroller and a handful of other parts to drive four servos and four digital outputs from the serial port on your computer. It can also be used as a development platform for other PIC projects.

PARTS LIST

● resistors	
(Metal Film 1% or 5%, 0.25W)	
R1	1k
R2	100k
● capacitors	
C1-5	10uF 25V electrolytic
C6	47uF 25V electrolytic
C7,8	22pF ceramic
C9,10	0.1uF MKT polyester
● semiconductors	
U1	MAX232
U2	7805 voltage regulator
U3	PIC16F84 programmed with SERVOCTL.HEX
D1	1N4004
D2	5mm red LED
● miscellaneous	
4MHz crystal, 8 x 3 pin PCB header pins, 16-pin IC socket, 18-pin IC socket, DB9 90-degree female connector, 2.5mm PCB-mount DC power socket, 3mm bolts and nuts, PCB standoffs.	

I HAVE BEEN working on a robotics project recently, and decided that I needed to use servo motors from a remote control aircraft to control parts of the mechanism. Unfortunately, I had no simple way to control them so I designed this small circuit.

It uses a PIC16F84 microcontroller to generate the PCM control signals for up to four servos. The PIC is controlled by a host computer via its standard RS232 serial port. (COM1, etc.) The commands allow the controlling program to specify the position and neutral point of each of the servos independently, and also control four digital outputs.

The commands are simple one or two byte sequences that are easily constructed and transmitted to the PIC. A sample QBASIC program is available which demonstrates how this is done. If you would like to download it, the PIC assembly code or the HEX file to program your own PIC, please visit the following web site: **www.digitalnemesis.com/ash/projects/picservo**. Those three files are also available as SERVO.ZIP on the EA website (**www.electronicsaustralia.com.au**), in the Free Downloads area.

The Circuit

Fig.1 shows the complete schematic for the servo controller. As you can see, there is not much to it as all the hard work is done in the PIC software.

Power for the circuit is derived from a 9V DC plug pack, which is regulated down to 5V by the 7805 three-terminal regulator. The centre connector of the plug is positive, but diode D1 provides reverse polarity protection just in case. C9 bypasses the supply and helps stabilise the regulator while C6 (the 47uF electrolytic) helps filter the incoming power from the plug pack.

The interface to the host computer's serial port begins at P1, a female DB9 connector. Pins 1, 4 and 6 (CD, DTR and DSR) are connected together to ensure the host computer will accept serial data from the PIC at any time. The signal ground (Pin 5) is connected to the circuit ground, and the remaining signals are sent to the MAX232.

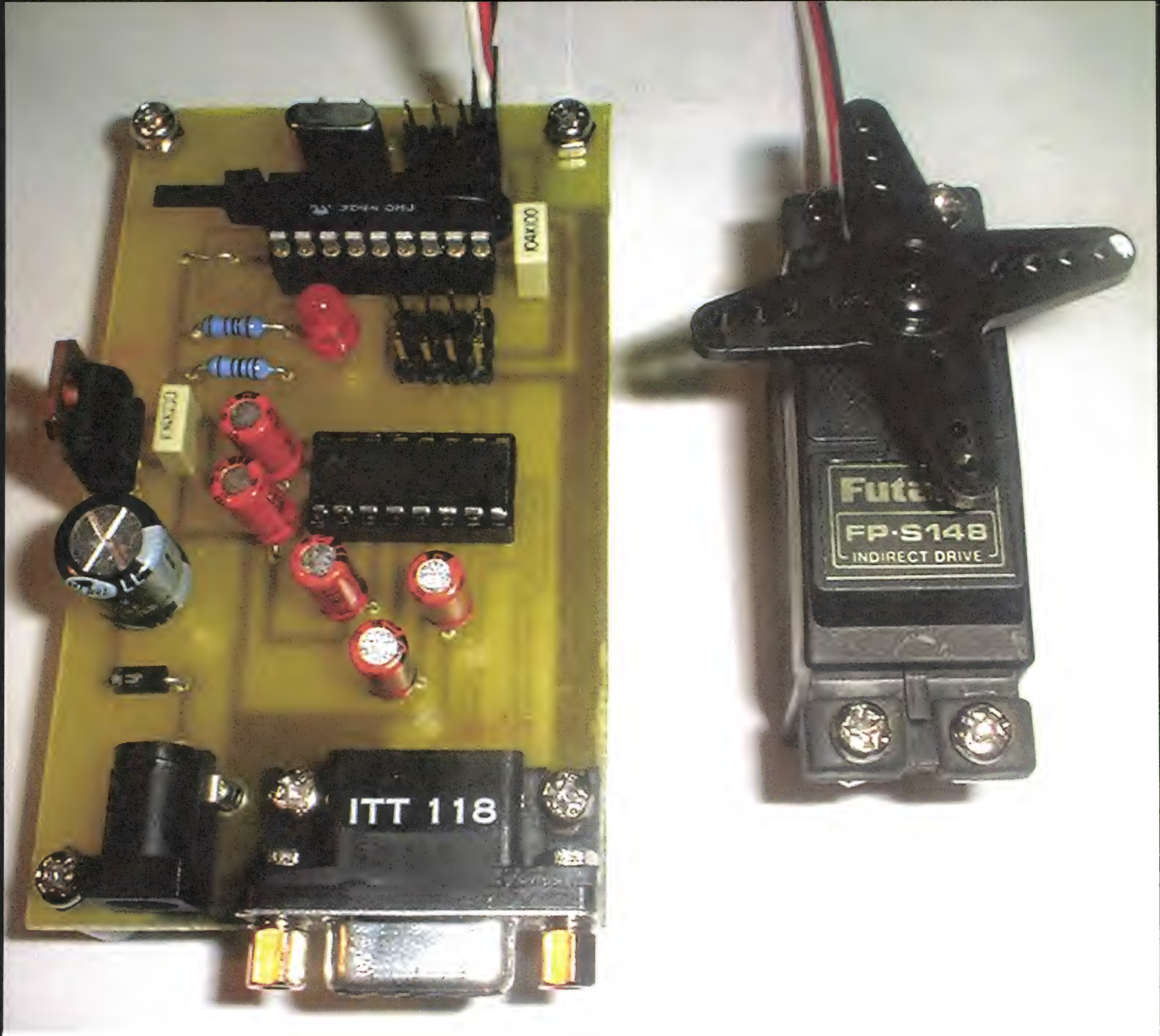
The MAX232 is a single power rail RS232 interface circuit. It takes care of converting the RS232 signal voltages to CMOS logic levels that the PIC can use. It has two receivers that convert RS232 levels to CMOS levels, and two transmitters that convert CMOS to RS232 levels. It has an on-chip DC-DC converter, which uses four 10uF capacitors (C1, C2, C4 and C5) to generate +10 volt and -10 volt rails for the RS232 interface. C3 simply bypasses the 5 volt power rail.

The RX line (data going to the host computer) from the serial port is connected to the MAX232's first transmitter's output, which in turn is driven by the 'SerialOut' signal from the PIC's RA0 pin. The TX line (data coming from the host) is connected to the MAX232's second receiver, which then drives the 'SerialIn' line (RA3) on the PIC. Similarly, the incoming RTS signal is routed via the first receiver to RA1, and the CTS signal is sent from RA2 to the second transmitter and on to the host's serial port.

All of Port B on the PIC is dedicated to driving the servos and digital outputs, where RB0 to RB3 drive the digital outputs 0 to 3 respectively, and RB4 to RB7 drive servo outputs 0 to 3. Note that the connectors for the digital outputs and the servos are wired identically - this is so you can add more servos by simply changing the PIC code. It would also be possible to convert some of the pins to inputs, which could then report the status of other sensors to the host computer.

The 4MHz crystal Y1 and the two 22pF ceramic capacitors are connected to the PIC to form its clock oscillator. The clock signal is divided by four internally to derive the PIC's instruction clock, resulting in a 1ns execution time for each instruction. This is important for the timing of both the serial communications and the servo control pulses.

LED D2 is connected between RA4 on the PIC and the power rail via a 1k current limiting resistor, R1. The PIC software lights the LED whenever a data byte is received from the host, by driving RA4 low. The 100k resistor (R2) apparently bypassing the LED is very important! RA4 is an 'Open Drain' output, meaning that it can only pull



***Plug the Servo** unit into your PC's serial port, and you'll be controlling standard servos - like the one shown here - in no time. It's simple to program using a standard language such as QBASIC, with code to get you started available on the author's (and EA's) website.*

the pin low and cannot make the pin positive, so it relies on external components to do this.

Here, this 'pullup' resistor is important when modifying the value of individual bits on the PIC port, since the PIC will first read the state of *all* the pins into a register, do the modification on the one it is interested in, and then write the register contents back to the output pins.

If R2 wasn't there, the RA4 output would be effectively floating when the pin is supposed to be high (LED off). So when the PIC *reads* the value of the pin it could appear low, which when written back out of the register would ultimately turn the LED on - wrong!

A long and fruitless night was spent trying to debug the PIC code, only to read about this in the PIC datasheet hours later. Argh!! The moral of the story - RTFM (Read The #@%#&$ Manual!)

The remaining connections to the PIC are C10, a supply bypass capacitor, and the MCLR (reset) pin which is tied high so the PIC actually runs.

Construction

The circuit is quite straightforward and there are not many components. You could construct the circuit on 'veroboard' or similar without too much difficulty, if you keep the crystal and its 22pF capacitors close each other and the PIC. However the PCB design accompanying this article makes it a breeze.

First inspect the PCB for any missing or broken tracks, and while your trusty soldering iron warms up, identify all the components.

It is best to start with the lowest profile components and work your way up. I suggest that you use IC sockets, especially for the PIC. If your not going to use IC sockets, don't fit the ICs yet as they will need to be removed for testing. If you intend reprogramming the PIC, I'd also suggest that you invest in a machine-pin IC socket for it. You can then 'zip' tie the PIC to the machine-pin socket and then place it into the standard IC socket - as shown in the pictures of the prototype. This allows you to easily remove

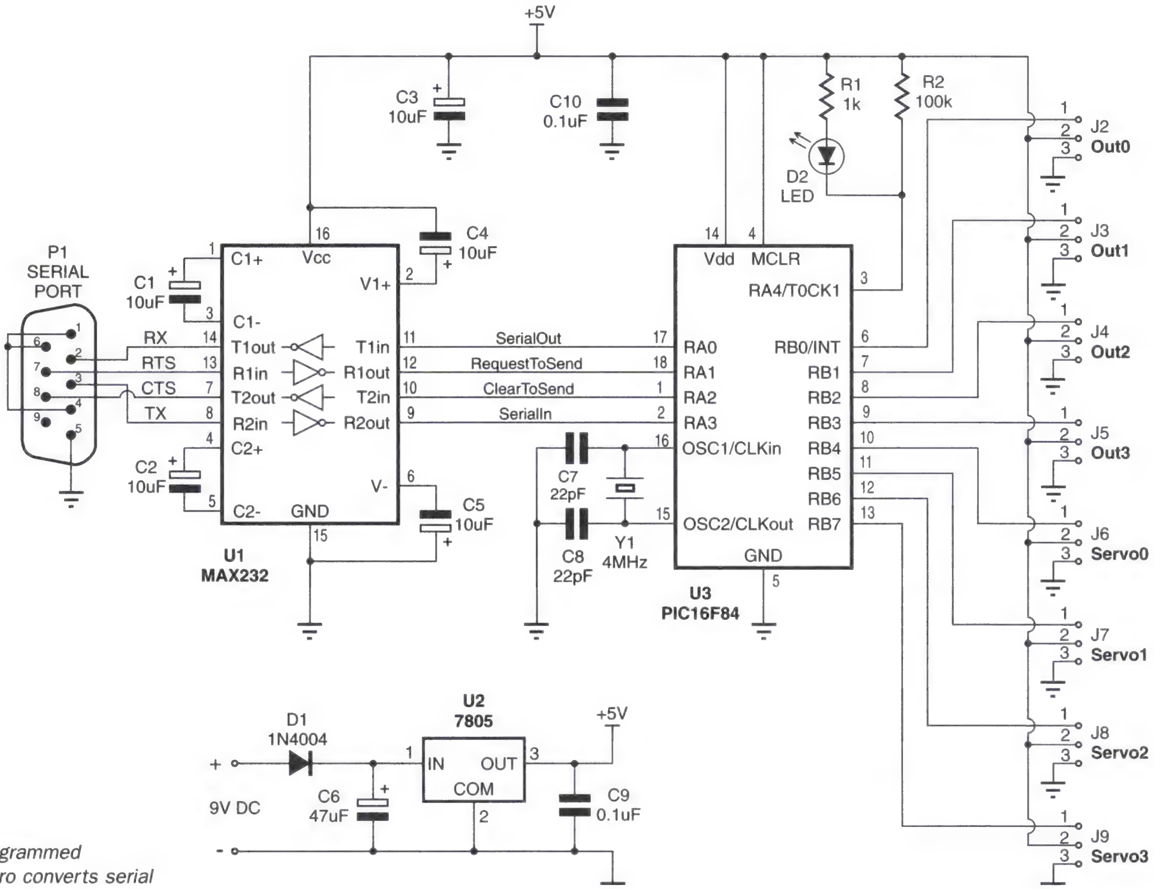


***Fig.1:** The programmed PIC16F84 micro converts serial data from the PC to four standard servo drive signals, plus four digital outputs. The MAX232 simply acts as an interface between the PC and the PIC.*

***Full size** versions of the component ovelay diagram and PCB artwork are shown opposite, on the right.*

and refit the PIC, without fear of bending pins.

Refer to Fig.2 during construction to aid you with positioning the components. Start with the two resistors, and use the excess lead from one for the link on the board above the PIC. Next fit the two 22pF ceramic capacitors to the right of the PIC.

Insert the two IC sockets now, as it would be fiddly to get the pins to line up with the holes later, when the other components are in place. Remember, don't insert the ICs yet as you'll need to remove them before testing.

Next, fit the two 0.1uF MKT capacitors - one below the PIC and the other below the 7805 regulator. These are not polarised, and may be inserted either way around.

Now install the 47uF electrolytic capacitor and the five 10uF electrolytic capacitors, while taking

Servo Controller Commands

To control the servos and outputs we need to send commands to the PIC. Some of the commands are single byte commands; some however require two bytes.

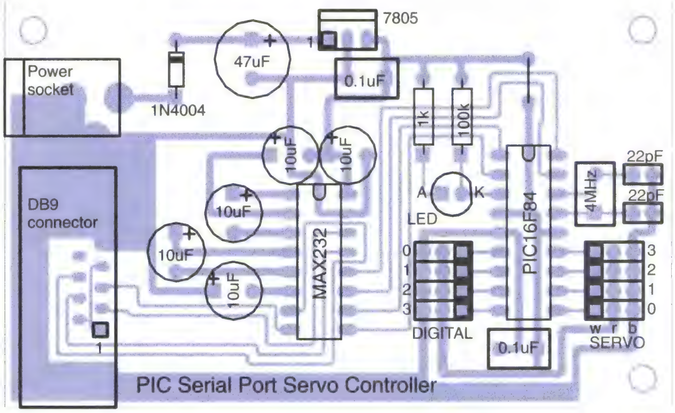
The first byte always contains the command, and the channel to which the command applies. We will call this the 'Command' byte. The second byte, when needed, will contain data for the command; we will call this the 'Data' byte - this is used when we need to set the servo offset or position, for example.

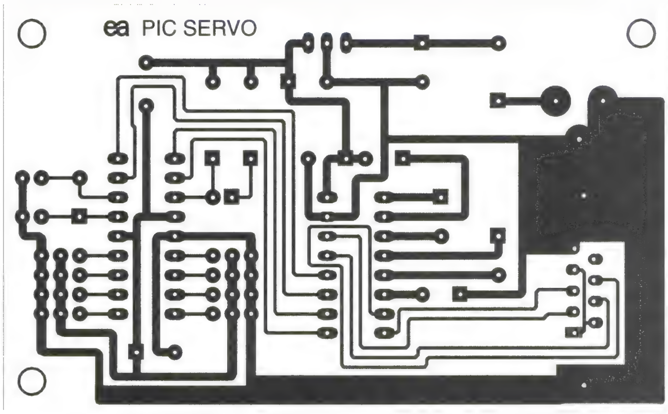
The command byte is split into two nibbles (4 bits), where the upper one defines the command to execute, and the lower defines the channel (which servo or digital output) is to be affected.

Command				Channel Select			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Currently, the software recognises only channels zero, one, two and three. The following are the commands and their numerical value. To build command bytes, add the command value to the channel number.

Hex	Decimal	Data Byte	Description
00	0	Yes	Reset the controller. All outputs off, all servos disabled and all servo position and offset values are set to 128 (midrange). The data byte following this command MUST be zero. To ensure that a reset command it actually executed, send three consecutive zero bytes.
10	16	Yes	Set the servo output 'Position' value for the servo specified in the channel nibble. The data byte contains the new position value between 0 and 255.
20	32	Yes	Set the servo output 'Offset' value for the servo specified in the channel nibble. The data byte contains the new offset value between 0 and 255.
30	48	No	Enable Servo Output. Start generating the servo control pulse for the servo specified in the channel nibble.
40	64	No	Disable Servo Output. Stop generating the servo control pulse for the servo specified in the channel nibble.
50	80	No	Set Digital Output On (High). Set the digital output specified in the channel nibble high (5 volts).
60	96	No	Set Digital Output Off (Low). Set the digital output specified in the channel nibble low (0 volts).





care that they are inserted the correct way around.

Break up the sections of header pins into bunches that are three pins wide. You can use a pair of side-cutters if you like, but I just pressed by thumbnail into the notch between the pins where I wanted to break them. You will need eight lots of three, which you can then insert and solder.

I found that it is best to start from one end; insert one and solder it before inserting the next so you can get the tip of your soldering iron to the pins.

Next fit the LED, remember that the flat side on the case or the short leg is the cathode (-ve) and goes towards the PIC.

Special consideration needs to be given to the reset command - as the state of the command parser in the PIC is not known when it is issued, we actually need to be a little tricky. The parser could be waiting for a command - in which case it would work - or it could be waiting for a *data* byte, in which case it would get a little confused.

Therefore we will make the reset command a series of three zeros, and have the parser on the PIC detect that there is an extra byte, and then ignore it.

When the servo controller receives a reset command it will turn everything off, set all the servos position and offset values to midrange, and send the string “Reset” to the serial port with a ‘carriage return’ and a ‘new line’ character appended.

Example Commands

Enable Servo 0: 48 + 0 = 48 (ASCII ‘0’)
Enable Servo 2: 48 + 2 = 50 (ASCII ‘2’)
Disable Servo 0: 64 + 0 = 64 (ASCII ‘@’)
Disable Servo 0: 64 + 2 = 66 (ASCII ‘B’)
Set Servo 1 Position to 180: 16 + 1 = 17 then 180

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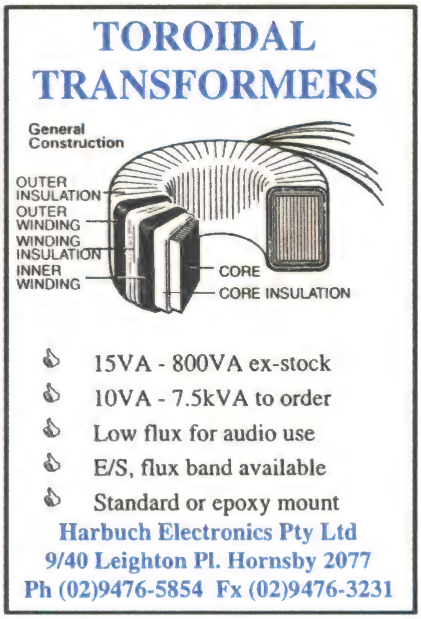
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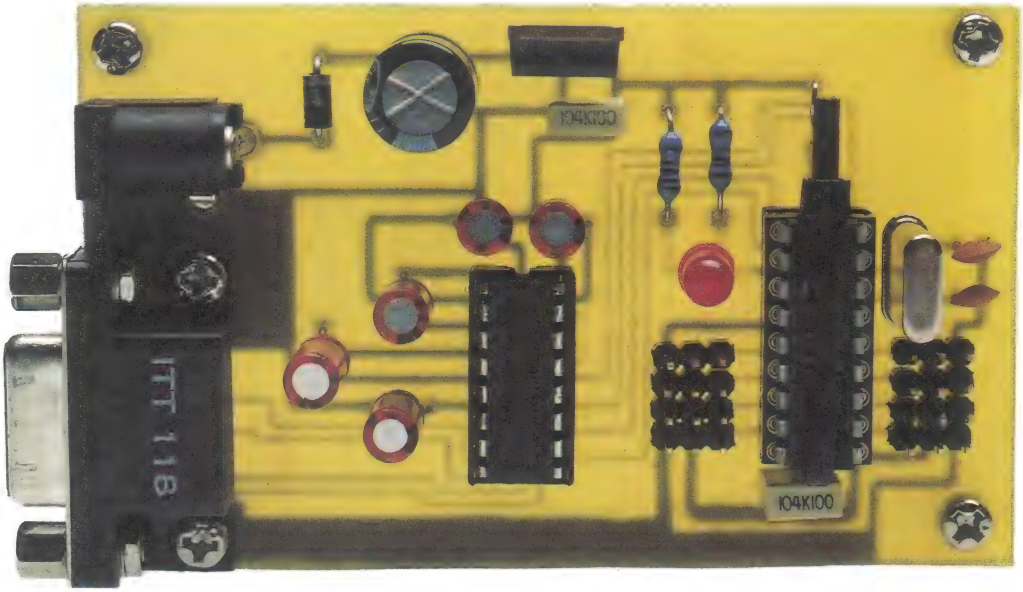


***Small, neat** and effective, the Servo Controller is very easy to build and get going. Note the cable tie around the PIC and its socket, which in turn fits into a matching socket on the board.*

You can now insert the crystal, which is not polarised and can be insert either way around. Then install the 7805 regulator while making sure that the metal tab is towards the edge of the board.

Lastly, solder in the power socket and the DB9 connector. I found that holding the power socket in place with a piece of tape while I turned over the board to soldered it worked well. If you're using a 90-degree DB9 connector it should have mounting holes to allow it to be bolted to the PCB, or clips that penetrate the PCB. It is a good idea to bolt it in before you solder its pins, as it stops you putting pressure on the joint and ripping up the pads and tracks - it also stops it falling out when you flip the board over to solder it. If you have metal clips, just solder them in.

Done, take a break. Come back and inspect all your joints, especially the ones on the MAX232 and the DB9 connector where a track goes between the pads, to make sure you didn't accidentally short anything out.

Testing

You will need a 9V DC power supply with a 2.5mm power plug (centre positive) and a serial cable to connect the controller to your computer. You will also need a serial communications (sometimes called a 'Terminal') program. I used 'HyperTerminal' as it comes with Windows.

First, without the serial cable or ICs plugged in, power up the board and measure the voltage between pins 5 (-ve) and 14 on the PIC, and across pins 15 (-ve) and 16 on the MAX232. They should both be around 5 volts.

Remove the power and insert the MAX232, with pin 1 facing the DB9 connector. Connect the power again, and test the voltage between ground (pin 15) and pin 2 of the MAX232. You should read close to 10 volts. Now check between ground (pin 15) and pin 6, where you should get -10 volts. If not, check that you inserted all the 10uF capacitors the correct way. If all is well, we know the DC-DC converter is working in the MAX232, so we can move on to testing the serial port.

Without the PIC installed, put a jumper wire between pins 3 and 5 of the PIC socket - the LED should light. If not, check that you have installed it the correct way around. Remove the jumper.

Now put a jumper between pins 1 and 5, and between pins 2 and 17 of the PIC socket. This loops the serial data back to the PC host and sets the CTS signal active (low), so the host is enabled to send data. Plug a serial cable between the computer and the DB9 connector, then apply power to the controller board again.

Run your terminal program and open the serial port (say, COM1) that's connected to the servo controller. Set the serial port speed to 2400 baud, eight data bits, and one stop bit, no parity and 'Hardware' flow control.

You should now be able to type into the terminal program and see the characters appear as you type. Try moving the link from pins 1 to 5 and placing it between 1 to 14, then type a few characters. You shouldn't get any characters displayed, since the serial port is buffering them because the CTS line is inactive. If you move the link back to pins 1 to 5 again, what you've just typed should appear. This means that your serial port, the MAX232 and the hardware flow control are working properly.

If moving the link from pins 1 to 5 doesn't seem to stop the characters appearing you type, you probably haven't set the port to use hardware flow control. Sometimes it is labelled CTS/RTS flow control.

Now remove the power, unplug the serial cable from the controller, remove the links in the PIC socket, and then insert the PIC - again, pin 1 faces the DB9 connector.

Connect a servo to the 'Servo0' output, remembering that the white wire on the servo lead is the control signal, and goes closest to the

PIC. Connect the serial cable and open the serial port in your terminal program again.

When you connect the power, the PIC will send a message to the computer, which should come up in the terminal window - it should send "PIC Servo Controller" then "Reset". You may also notice the servo twitches a little when you first connect the power. You should be able to turn the servo with your fingers and it won't resist or return to a point. This means it is not getting any position signals from the controller.

Let's send it some commands while we're here. Type a '0' (zero), this is actually the command to enable the output of servo 0, so the servo should move with a satisfying whirr! It should also resist your attempts to move it, but don't use too much force.

Now type an 'at' sign (@) and the servo should be deactivated so you can move it again. You should notice the LED light up for about a quarter of a second after the each character. You won't get anything displayed in the terminal program however, as the PIC is not echoing back the characters. It is in fact trying to read them as commands. Close your terminal program and power off the controller.

Congratulations, it works!

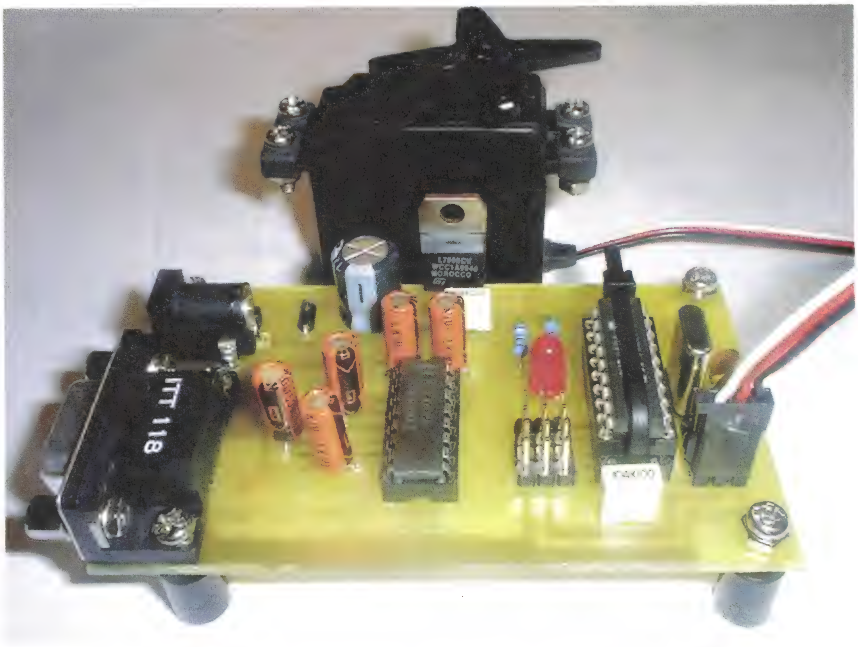
Host Program

An example program to control the servo and digital outputs written in QBASIC is available. It simply opens the serial port and sends an example of each command to the controller.

A host program can be written in any language that can access the serial port. It must configure the port for 2400 baud with 8 data bits, no parity and 1 stop bit, with hardware flow control. It should then send a reset command to reset the controller, which brings everything back to a known state. The reset state is where all digital outputs are off, all servo outputs are disabled, and all servo offsets and positions are set to 128.

From there the program would build commands and send them to the serial port to control the hardware, probably under control of some other input (a joystick for instance). Refer to the side bar for details of the servo controller's commands. **ea**

The finished board *with servo attached. Note that the white wire from the servo goes towards the PIC.*



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EXPERIMENTING **WITH ELECTRONICS**

DARREN YATES

Transistors – 3:
Designing Preamps

This month, Darren Yates looks at audio preamplifiers – from the nice and simple to the rather more complex...

IN LAST MONTH'S EWE, we looked at how to read datasheets and how to make sense of all those numbers and bits of info. Normally, all words and no circuits makes Jack a dull boy but it's important you get an understanding of how transistors work.

But really, the best way to learn is to roll up your sleeves, power up the workbench and build a few circuits. So here we go...

Chips or transistors?

Being a bit of an audio nut, I really enjoy building different types of audio circuits – everything from valve amps to basic transistor power amplifiers to all-in-one single chip designs. However, as I discovered recently, whacking a power amplifier chip on a board isn't always a guarantee that the chip will do exactly what you want.

I recently built a 50W power amplifier for a friend who plays bass guitar. He already had the speaker setup but wanted a decent power amp. Having used this particular power chip before, I thought it would be ideal for job – quick, easy and quite cheap.

Getting the chip working was no drama however it turned out that this particular chip had built-in temperature protection and kept switching off if the bottom bass string (this was a five-string bass) was hit too hard – even though it was well below its 50W output and bolted to a heatsink the size of the Queen Mary. This chip would be more suited to hifi rather than instrument use.

The moral is that chips are quick, but discrete designs give you far more control over what happens.

Audio preamplifiers were among the more popular chips in the 1970s. ICs such as National's LM382 were considered 'state of the art'. However, as tape decks improved and our ears fell in love with the compact disc, these chips fell out of favour.

While not quite up there in the CD category, a good old transistor design is still well worth having in your circuit collection. Let's get started...

Preamp 1

Fig.1 shows the simplest worthwhile one-transistor preamplifier. There are simpler circuits but they're not as stable. Using a single transistor, this common-emitter amplifier has a gain determined predominantly by the collector resistor divided by the dynamic impedance of the emitter junction.

This impedance is known as 'little re', or just *re*. You can calculate *re* from the following: ***re* = 25mV/Ie**, where Ie is the DC emitter current.

The emitter resistor itself doesn't affect the gain because it is bypassed by the 22uF capacitor, however, it does affect the low-frequency response. Remember that the lower-3dB point of this circuit is determined by these two components.

With a 22uF capacitor, the -3dB point is 7Hz, so the amplifier will provide good amplification right across the audio spectrum.

Despite its simplicity, there are one or two problems with this circuit. Firstly, because it uses a common-emitter design, the output is out of phase with the input – you would need to invert it again or change the speaker connections to ensure the signal was the right-way around when you hear it.

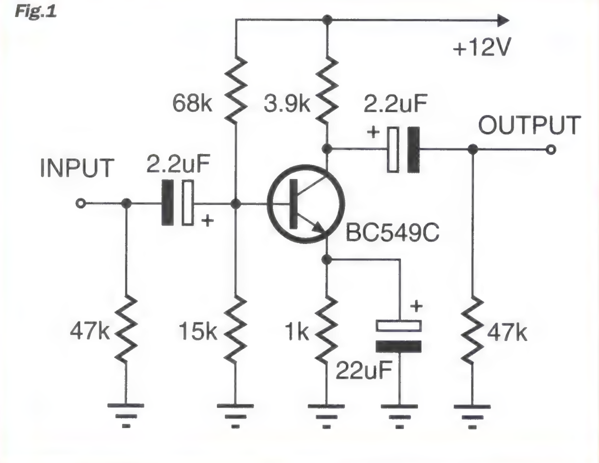
The second is the fact that setting the gain is not exactly an easy task since the value of *re* changes with temperature and the amount of current flow.

While the circuit as shown uses an NPN transistor, you could easily substitute a PNP type (such as a BC559) in place – just remember to swap the power supply around, along with the polarity of the electrolytic capacitors.

Still, it does the job and this is as good as you'll get with just one transistor.

Another change you could make is to disconnect the positive-rail end of the top base resistor and connect it to the collector instead. This adds more local negative feedback and makes the amp even more stable, however you'll still have the same gain problem.

Fig.1



Preamp 2

Another problem with Fig.1 is that it doesn't have a very high input impedance. In most situations, this isn't a worry. However, when it comes to amplifying the signal of a crystal radio set, you'd be lucky to get a peep out of the circuit in Fig.1.

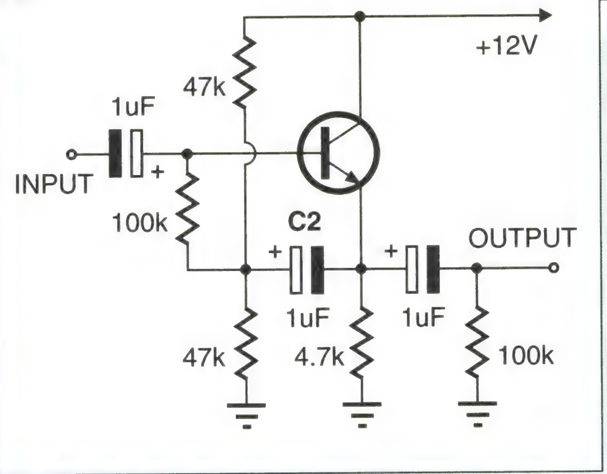
One way around it is to add in a couple of extra passive components to create what's called a 'bootstrapped emitter-follower' shown in Fig.2. This differs from Fig.1 in that the signal is taken from the emitter rather than the collector.

That means you get didley-squat voltage gain but you do get significant power gain and for a high-impedance signal, that's actually more important than voltage gain at this point.

The way it works revolves around capacitor C2, which couples the emitter signal back to the voltage divider from which the base of Q1 is biased. In theory, this jacks the input impedance up to infinity because the base and emitter both have the same in-phase signal and there's no AC current flow.

In practice, it's more around several megaohms due to gain losses in the transistor but that's still way above the circuit in Fig.1. You'll still need a circuit such as Fig.1 connected to the output of this circuit to get the required voltage gain to feed into a power amplifier, but it's an easy way to connect up to a high-impedance signal source. The downside is that the noise level also goes up. However, if it's a case of signal plus noise or no signal, it's better than a poke in the eye with a burnt stick.

Fig.2



Preamp 3

Fig.3 is a circuit that's a bit of a favourite of mine.

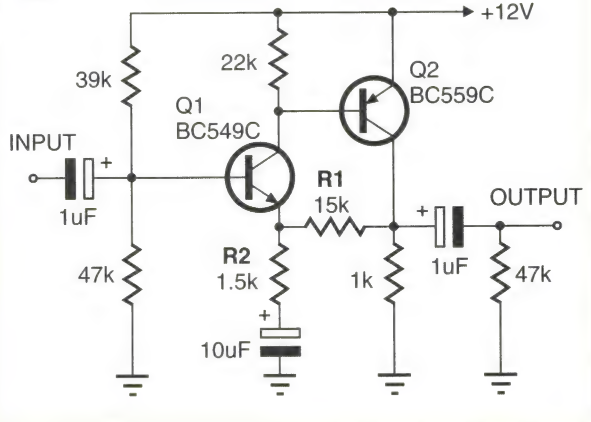
Again, it's not very flashy however it is surprisingly effective with a signal-to-noise ratio (SNR) of around 65dB and a total harmonic distortion (THD) figure of around 0.1 percent. The circuit uses one BC549 NPN and one BC559 PNP type transistor with negative feedback controlling the gain (the gain is set by the ratio of resistors R1 and R2).

When changing the gain, which you can do quite easily and over a fair range, only adjust resistor R2. Adjusting R1 will upset the DC biasing conditions. Strictly speaking, the collector resistor attached to transistor Q1 is not really necessary however it actually helps make the output more linear, and also improves the THD figure.

Using low noise transistor types such as the BC549C and BC559C will help improve the SNR but as a simple all-round circuit, this one is easy to get going and is virtually bulletproof. It works with a supply voltage anywhere between 5 and 18VDC and further with some slight component tweaking.

The thing I like about this circuit it the fact that the output is in phase with the input so you don't need another inverting stage. You can easily experiment with this circuit too – try changing a few component values and note the effect at the output.

Fig.3



Preamp 4

Similar but slightly different, the circuit in Fig.4 allows you to work with just NPN transistors, if you don't have any PNP types lying around.

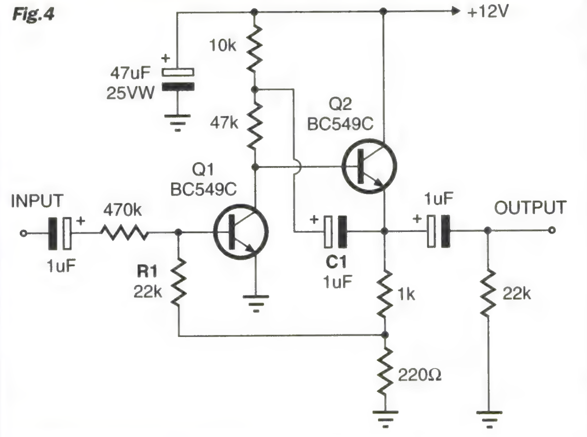
The circuit gain is determined by resistor R1, which applies the negative feedback right back to the base of transistor Q1. Increasing it raises the gain and vice versa. The maximum gain of the circuit is about 200.

The interesting addition in this circuit is the inter-stage coupling capacitor C1, which couples the output back to the tap between the two collector resistors of Q1. This has the effect of putting the same signal across both sides of the lower resistor, effectively bootstrapping Q1's collector load.

Have a go with this circuit and see how you do. As with the other circuits, both transistors should be low-noise types such as BC549C to get the best SNR, although any small-signal NPN devices would do well. To get the lowest noise, you need to match the input impedance with the input device. As shown, the circuit would be ideal to use with a 600-ohm dynamic microphone.

Right, that's enough for this month - more again next time, when we plan to cover the next stage in the audio chain, the power amplifier. Wohoo – scary stuff! Stay tuned... **ea**

Fig.4



Serviceman Index (Sep 96 - Jun 00)

THE SERVICEMAN is perhaps one of EA's most popular columns, with its many stories covering the repair of just about every TV, VCR or other electronic device you care to mention. These stories can be very useful when repairing your own (or someone else's!) equipment, and so to help you track down the story on a particular model, we publish (from time to time) an index covering the last few years worth of the Serviceman.

Well, it's that time again!

This month we are publishing the third installment of this ongoing index, covering all the Serviceman stories from September 1996 to June 2000. This follows on from our previous index published in August 1996 (covering August 1987 to March 1996), and the one before that, published in January 1988, covering everything published from January 1975 to July 1987.

The index is sorted in alphabetical order of manufacturer, with the type and model number of the item, along with a brief description of the fault and subsequent repair. Obviously there isn't space to give a full account of the problem and repair, but with the issue date and page number, you should be able to track down the related story quite easily.

With this index covering nearly four years worth of stories, and all three indexes covering the period of colour television in Australia, this index will make a handy reference for anyone called upon to service or repair electronic equipment — either willingly or unwillingly!

The full index, covering everything from January 1975 to date is available from our Website in the General Files download area.

BRAND	PRODUCT	MODEL	PROBLEM	REPAIR	ISSUE	PAGE
Aiko	CTV	SC-2037VR	No go. Blue flash on screen at switch on	No regulation on HT rail produces excessive volts on all rails	Feb-00	57
Akai	VCR	VC-G80S	Unable to tune channels	All setups on remote control, inc time and tuning	Nov-99	41
Akai	VCR	VS-3EA	Intermittent loss of sync, with vertical roll	TR44 (luminance emitter follower) leaky	May-00	48
Akai	VCR	VS-650EA	Wavy black diagonal bars throughout system	Open circuit electros in power supply	Jun-00	78
Altronics	Inverter	1.2kW	No go after loud bang	Protection circuit components short circuited	Dec-98	34
Amstrad	Computer	1640	Erratic error messages	PCB corroded by possum piss	Jun-97	46
AWA	CTV	C617	Crackling sound, not affected by volume control	Metal migration on driver transistor pins	Jan-98	39
AWA	CTV	C6345T	No go	Faulty line output transformer	Jul-96	47
AWA	CTV	C4817	Hissing and crackling, bad colour	Faulty power switch, faulty degaussing thermistor	Apr-00	75
AWA	CTV	C3802	Intermittent no-go	EHT leakage from faulty line output transformer	Feb-97	48
AWA NZ	Transceiver	TR245	Transmits on wrong frequencies	Faulty channel selector IC	Jan-97	22
Baldwin	Organ	Cinema 2	No 'Fantom Fingers' effects	Broken track due to seaside corrosion	Dec-96	42
Chatterbox	Voice synth	ETI Jan 85	Would not work when transferred to a PC	Bad contact in IC socket	Dec-99	58
Conn	Organ	Not stated	Would not remain in tune	Unstable oscillator transistors	Nov-96	45
Delco	EMC	Not stated	Intermittent operation	Inaccessible dry joint	Mar-97	42
DIC	Desoldering tool	SC-5000	Shorted AC input while being used	Carbon from motor brushes falls onto live PCB	Jul-97	46
Digital	Lap-top	CT475	Power supply failure	Concealed fuse open circuit	May-97	47
Gerni	HP Washer	410	Machine stops after 45 seconds	Reed switch magnet in flow controller defective	Jun-99	29
Gerni	HP Washer	2500	Would only run when fuel tank almost empty	Fuel level sensor switch installed upside down	Nov-99	42
Goldstar	CTV	CBY-9321	Very dark picture	C820 & C821 open circuit	Jun-97	48
Goldstar	CTV	CBT 9328	EHT and sound OK but only black screen	TDA3562A video processor chip faulty	Jan-99	33
Hammond	Organ	Grandee	Restoration of derelict instrument	General service, including replacing a missing PCB	Jan-98	37
Hammond	Organ	Not stated	Numerous faults in old, discarded instrument	Cleaned up after mice evicted. New PCB connectors	Oct-97	37
Hammond	Organ	VS222	Intermittent pedal output	Leaky transistor caused toggling Vcc	Sep-98	36
Hankin	Pinball machine	Howzat	Most functions inoperative	Most faults due to bad ceramic caps	Apr-97	48
Healing	CTV	R3452	No colour	Hidden dry joint under IC pins	Oct-96	46
Hitachi	Tape deck	D-E25	Tape transport inoperative	Alternative spring rigged to replace broken leaf spring	Nov-97	38
Home brew	Amplifier	—	P/S blown up. Damaged control unit	Power supply earth return diverted through signal earths	Sep-99	44

Home brew	Amplifier	—	Blew output chip at first switch-on	Vcc too high. Was transformer wrongly labelled?	Oct-99	41
Junghans	Clock	Not stated	Runs erratically, stops etc.	Corrosion on battery contacts	Jul-98	37
Kambrook	CTV	CBS4316	Intermittent no go	Dry joints and seaside corrosion	Nov-97	38
Kriesler	CTV	59-4	R 603 smoking on deflection board	IC290 shorted	Feb-97	46
Lavoie	CRO	LA-265	No go. Most rails showing low voltage	1% resistors gone high. Weak valves. Shorted turn in power TX	Sep-99	43
Makita	Power drill	6012D	Low power even with fully charged batteries	Clean commutator and re-lubricate	Mar-00	42
Marantz	CD Player	Not stated	Disc speed too high with no servo control	Broken earth tracks at microprocessor	Dec-99	59
Masuda	TV	HTV-700	No EHT	Open circuit diode, fitted in wrong position	Oct-96	49
Meguro	CRO	MO-1252	No screen trace	Damaged pin in plug and socket assembly	Jan-97	25
Mitsubishi	Heat pump	Not stated	Intermittent, erratic operation	Replace computer board in control system	Jan-98	36
Motorola	UHF CB	MX350	Motorboating on receive	Short between freq synth and audio board	May-96	49
National	CTV	TC-2077	Intermittent no raster and low hum	Dry joint under rivet at horizontal output transistor	Dec-98	33
National	Microwave	Not stated	Intermittent touch plate and display	Moisture sensitive short circuit	Jul-96	46
National	Microwave	Not stated	No 'Clock Set' function	QC sticker interfering with Clock Set button	Mar-97	45
National	VCR	NV-600	Beeping noise at 2:05am daily	Child's watch on ledge behind set	Apr-98	38
National	CTV	Not stated	No colour	Auto-colour trimpot burned up	Jul-98	37
NEC	CTV	N2266	Loud hissing sound	Broken wire in horizontal winding in yoke	Nov-96	46
NEC	CTV	Not stated	Distorted colour	Magnet in power meter on wall behind set	Feb-99	36
NEC	CTV	N1423	No vertical deflection	IC701 heat sensitive. Read about a very novel repair	Jun-96	46
NEC	Printer	P5300	Printhead jammed	Machine filled with thick, greasy deposit	Oct-97	34
Notes	—	—	On the jobs that are given to retired servicemen	—	Jan-98	30
Notes	—	—	On the effect of lightening on computers etc,	—	Jan-98	36
Notes	—	—	On the safety of separate amplifier/power supplies	—	Jan-00	57
Notes	—	—	More on remote controls and compact fluoros	—	Jan-00	57
Notes	—	—	On keeping earth leads short	—	Jan-98	32
Notes	—	—	On electrical safety	—	Jan-00	58
Notes	—	—	Degaussing videotapes left on top of TV	—	Jan-98	35
Notes	—	—	Servicing breadmaking machines	—	Jan-98	32
Notes	—	—	Makeshift service in New Guinea	—	Jan-98	37
Notes	—	—	Breadmaking machines	—	Jan-98	37
Notes	—	—	TETIA/TESA Convention at Bendigo	—	Jan-98	36
Notes	—	—	Servicing vintage radios before they were vintage	—	Jan-97	46
Notes	—	—	On double insulation on early computers	—	Jan-98	35
Notes	—	—	On touch switches and RF interference	—	Jan-98	34
Notes	—	—	On heater/cathode shorts	—	Jan-00	76
Orion	CTV	26ED	Totally erratic behaviour	Solder ball loose under microprocessor chip	Feb-99	36
Palsonic	CTV	4824	Multiple faults in junk set	Original fault not found but set OK after many small faults repaired	Jan-99	34
Panasonic	VCR	NV-FS90	Won't play. Won't accept tape	Cassette carrier assembly slightly out of position	Aug-98	34
Panasonic	VCR	NV-FS90	Goes into frame advance instead of pause	Bad connection between jog/shuttle board and main deck	Aug-97	31
Panasonic	VCR	J1	Slow to tune UHF channels	Fast tune by holding down 'Next' button	Nov-99	41
Panasonic	VCR	J1	Difficult to tune UHF channels	Tuner OK but very slow to tune on UHF	Jul-99	40
Panasonic	Microwave	Not stated	No go	HV filter (1uF 2kV) defective	Aug-99	43
Panasonic	VCR	J1	Power supply wont start up	C1103 (1uF 200V) startup capacitor open circuit	Jul-99	40

Serviceman **Index**

Philips	CTV	K11 chassis	Power supply makes ticking sound	Faulty tripler, shorted line output transistor, open circuit resistors	Mar-00	42
Philips	Tape recorder	EL3546	No FF or REW	Idler tyres perished. Replaced with suitable 'O' rings	Aug-99	41
Philips	Tuner	AH160	Tuning drifts	Faulty trimmer capacitor	May-98	36
Philips	TV	SD23CX	No horizontal sync after 15 minutes warmup	Valve type critical - only works with Philips-made tube	Sep-97	36
Pioneer	Amplifier	Not stated	Crackling noise, after volume control	Faulty transistor - position sensitive	Jun-98	36
Playmaster	Amplifier	29587	Noisy output caused by supersonic oscillation	Dry jointed 1000uF electrolytic	Nov-98	32
Playmaster	Amplifier	29587	Intermittent distortion in one channel	Faulty quiescent current adjustment trimpot	Nov-97	39
Precedent	Rad/TV/record	Not stated	Turntable seized, stylus missing	Overhauls justified for sentimental reasons	Dec-97	37
Radford	Amplifier	Not stated	Low output from one channel	Defective output transformer	Sep-98	34
Rank Arena	CTV	Not stated	Intermittent vertical failure	Remove salt air corrosion from circuit board connections	Feb-99	35
Revox	Tape deck	77	Explosion, then tape speed faults	Old ceramic and electro capacitors breaking down	Sep-97	34
Royce	UHF CB	AUS100	No audio output	Speaker open circuit	Jun-98	34
Samsung	CTV	Not stated	No go	Corrosion due to unknown substance	Dec-96	44
Samsung	CTV	Not stated	Power switch won't latch on	Back cover wrongly installed, jamming switch action	Feb-99	36
Samsung	CTV	TV685	Remote control only works in daylight	Interference from compact fluorescent lamps	Jun-99	29
Sansui	Audio	DA-T1750	Intermittent low volume	No -20V rail. Short circuit electro in power supply	Jun-97	49
Sanyo	CTV	Not stated	Ingenious repair for broken channel knob	Use a water tap handle	Oct-96	47
Sanyo	CTV	CTP7605	Overbright picture with retrace lines	Resistor on tube base gone low	Sep-96	46
Sanyo	CTV	CTP7601	No go	Electro fitted so as to short HT rail to ground	Feb-98	38
Sanyo	CTV	CPP6001V	Fuzzy picture	Focus voltage low due to leakage caused by brown ants	Oct-98	34
Sanyo	CTV	CTP3621	No go	Faulty high voltage Zener	Jun-96	48
Sharp	CTV	3434	No go	Dry joints in power supply	May-00	76
Sharp	CTV	CX2082	Slow startup, retrace lines, intermittent no-go	Accumulation of small faults	Sep-96	45
Sharp	CTV	CX6352/62	No go	Broken track in chopper emitter circuit	May-96	46
Sharp	VCR	VC 583X	No tape forward motion, only rewind	IC701 faulty - mechanical relay used instead	Jul-97	48
Sharp	VCR	VC8300	Intermittent rewind	No fewer than five intermittents in the one machine	May-96	48
Sony	CTV	KV2212	No go, then erratic channel selection	Faulty power switch, gravity sensitive channel selector switches	Mar-98	31
Sony	CTV	KV1830AS	Won't start up	R628 R639 gone high	Apr-97	46
Sony	Audio	TC-560	One speaker dead on mono replay	Line output sockets not compatible with mono replay	Apr-96	42
Sony	CTV	KV-1830AS	No go	Various component failures. Wrongly fitted ultor cap	Oct-97	36
Sony	AM radio	ICR-2100	No go after 30 years rough use	Battery snap broken	Feb-99	35
Tandy	VCR	VR-2000	Won't record and only B&W playback	5k trimpot missing from module HIC 5L	Jun-97	47
Tektronix	CRO	564B	No trace. EHT transformer defective	Replacement adapted from copying machine HV unit	Mar-99	33
Telefunken	CTV	MP203TXT	No go. Fuse blown	Transistor in power supply shorted	Feb-99	37
Telequipment	CRO	S31	Hum and noise on trace	General overhaul - electros, resistors etc.	May-98	38
Toshiba	CTV	C-1421	Six or more horizontal bars, dark picture	Diode missing in screen adjustment circuit	Jun-99	30
Unknown	Radio TX	Not stated	50Hz buzz in all RF stages	Failed electro in new solid-state crystal	Apr-96	44
Unknown	PA system	Not stated	AM radio interference in one mike channel	RF choke fitted in patch panel	Apr-99	33
Unknown	PA amp	Not stated	Intermittent operation	Fractured track near main volume control	Nov-96	45
Unknown	Monitor	Not stated	No go	Open circuit bias resistor in power supply	Oct-98	36

Unknown	Industrial	Not stated	Problems with unreliable temperature sensors	Induced electrical noise upsetting constant current sensors	Jun-96	48
Unknown	Toaster	Not stated	A modern fairy story	Comments on computerisation	May-00	78
Unknown	Guitar amp	Not stated	No sound output	Headphone socket not soldered to PCB	Jul-97	49
Unknown	Gas chromatograph	CSIRO	Blows mains fuse	Fuse holder shorted to frame	Jun-98	35
Unknown	Lamp	Not stated	PIR control ineffective	Faulty capacitor across IC comparator	Nov-97	36
Unknown	Radio TX	Not stated	Landline problems	Duck caught in open wire feeders	Apr-96	45
Unknown	Radio/cassette	Not stated	Tape jammed around capstan	Expensive repair for careless owner	Aug-97	28
Unknown	Temp controller	Not stated	No go	Vcc supply resistor to TDA1024 IC open circuit	Jul-99	41
Unknown	VCR	Not stated	No rewind	Rewind clutch worn out	Apr-98	36
Unknown	Videotape	Not stated	One pre-recorded tape in set of three won't play	NTSC tape mixed in PAL set	Apr-97	47
Unknown	Washing machine	Not stated	Problems after replacing power cable	Confusion over switch in neutral line	Jun-00	76
Unknown	Wave solder	Not stated	Power supply failure	PVC sleeve on temp sensor cable melted	Apr-99	35
Unknown	Foot massager	Not stated	No go after use on 240V mains	Rating only 110V. Blown fuse the only damage	Jun-00	78
Unknown	Car electrics	Not stated	Lights fail when air-conditioning selected	PNP transistors on control board shorted and/or leaky	Jan-99	32
Unknown	Refrigeration	Not stated	Problems with re-possessing refrigerator	Frozen body stuck in cabinet	Apr-96	64
Unknown	Balance	Not stated	Erratic drift in precision balance	Ants nest inside load cell	Apr-99	34
Unknown	Alarm systems	Not stated	Driveway alarms triggering intermittently	Ants nest inside 'weatherproof' installation	May-99	34
Unknown	Alarm systems	Not stated	Random triggering at night	Mouse using PIR detector as springboard	May-99	35
Unknown	AM/FM radio	Not stated	Intermittent audio output	One transistor with a short leg	Aug-97	29
Unknown	AM/FM radio	Not stated	No reception on AM band	Oscillator coil open circuit	Mar-99	35
Unknown	Ceiling fan	Not stated	Runs very slowly	Wrong blade set fitted, 2 degrees difference	Dec-97	36
Unknown	Amplifier	Not stated	Brought in in pieces, in a box	Owner forgot to replace shorted output transistors	Aug-97	29
Unknown	Display panel	Not stated	Intermittent touch switch	Interference from nearby microphone cable	Jul-96	49
Unknown	CD radio tape	Not stated	CD reproduction weak and distorted	Dry joint under miniature plug and socket assembly	Aug-99	42
Unknown	Cinema	Not stated	Refurbishment of derelict drive-in cinema	Various	Nov-96	42
Unknown	CTV	Not stated	Full mains voltage on antenna socket	Short circuit between degaussing coil and aquadag	Mar-98	29
Unknown	DC/AC Inverters	EA Design	No go	Overloaded. Several small signal ICs defective	Jan-00	58
Unknown	Cinema amplifier	Not stated	Intermittent output	Faulty Canon plug and socket assembly	Apr-00	74
Unknown	Computer	386	Clock stops whenever power turned off	CMOS battery discharged - weird charging circuit	Jul-97	48
Unknown	Computer	Not stated	Bent pins on several SCSI plugs	Deformed socket in CD-ROM burner. Hardware virus?	Jul-98	36
Unknown	Computer	Not stated	Erratic startup, unreliable CD-ROM, modem etc.	Motherboard incorrectly mounted. Dry joints	Mar-97	43
Unknown	Computer	386DX	Won't boot up	CMOS backup battery low voltage	Mar-97	45
Unknown	Component inserter	Not stated	Won't respond to computer commands	IC logic gate short circuited	Apr-99	35
Unknown	Clock	Not stated	Electronics working but hands don't move	An earwig in the works. One leg left behind	Oct-98	35
Various	Remotes	Many	Intermittent or failed operation	Reconditioning contact surface under touch buttons	Sep-96	44
Vintage	Radio	Not stated	No go	Voice coil glued to speaker pole piece	Jan-97	24
Vintage	Radio	Not stated	Resistive power cord blamed for house fire	Cat 'secretion' destroyed cable insulation	May-99	33
Vintage	Radio	Various	Excessive HT	Vacuum tube rectifier replaced with solid state rectifier	May-97	49
Yaesu	Transceiver	FT23R	Intermittent low audio on transmit	Dry joint between daughter board and mother board	Jun-98	34
Yamaha	Synthesiser	YS200	Intermittent LCD panel, and loud bangs	Dry jointed pins on voltage regulators	Aug-98	33
Zenith	Radio	Not stated	Hot smell after 30 minutes	Faulty transformer	Feb-97	48

While every care has been taken with the preparation of this index, no responsibility can be accepted for errors or omissions. ea

5000-30mA
152391
TEST
Press to switch OFF
FLAG
ON OFF
RESET
Press & release to switch ON
HPM
ELECTRESAFE
Residual Current Interrupter
Protection against fatal electric shock caused by current through the body to earth

***A small ELCB** of the type used to provide protection for a single domestic appliance. It plugs straight into a power point.*

Earth Leakage Circuit Breakers

Earth leakage circuit breakers or ELCBs are widely used in homes, offices and factories to reduce the possibility of fatal electric shocks. Here's how they work.

By Jim Rowe

WHEN AN ELECTRICAL appliance or piece of equipment connected to the power mains develops a fault, there's a good chance that it may draw enough excess current to blow the normal 'overcurrent' fuse or circuit breaker. If so, the fuse or breaker will turn off the power and no further harm is done. That's what fuses and circuit breakers are designed to do.

However this isn't the only kind of fault that can happen. Another common type can establish a 'leakage' path to the appliance or equipment's exposed metalwork, which is normally connected to earth. This leakage path can allow a relatively small extra current to flow — not enough to blow the fuse or breaker, but still enough to be potentially lethal, if it were able to flow through a human user (and specifically through their heart).

It's generally accepted that an AC current of only 50mA or less flowing through the heart for even a few seconds can cause it to stop beating properly and begin twitching or 'fibrillating'. If not corrected rapidly this leads to death.

Murphy's law being as universal in application as it is, if a piece of equipment develops this kind of 'leakage to earth' fault there is also a good chance that sooner or later, the protective earth connection will also fail. And if that happens, the risk of the leakage current flowing through a human user is of course quite high.

This is the type of situation which ELCBs (sometimes called 'residual current devices' or RCDs, and formerly called 'core balance relays') are designed to protect against. The idea is that unlike a normal fuse or circuit breaker, they're designed to detect even quite small leakage currents to earth, and quickly disconnect the power if one should occur — before there's a chance for this current to flow through anybody.

ELCBs are made in various sizes and ratings, some intended to be permanently connected into the building wiring (either at the switchboard or inside individual power outlets) and others made as portable protection devices for building sites, equipment used in buildings without ELCBs and so on. Most of those sold for domestic use are designed to detect a leakage current of less than 30mA, and remove the power in about 20ms. These are known as Type II devices.

A more sensitive type of ELCB is used in hospitals and in doctors' and dentists' surgeries, where equipment is often connected intimately to patients. These ELCBs generally have a tripping current of less than 10mA, and are known as Type I devices.

Less sensitive ELCBs are also made for use with large motors and other heavy duty equipment in factories, mines etc. These devices can have tripping currents as high as 500mA.

The way an ELCB works is shown in Fig.1. The mains active and neutral wires are taken together through the centre of a toroidal magnetic core, which is also fitted with a sensing winding. The output of the sensing winding is fed to an AC amplifier and detector, and then to a trigger circuit driving the coil of the circuit breaker relay.

When the appliance(s) connected to this power circuit are not faulty, the currents flowing in the active and neutral wires will be identical during all parts of the AC wave. The current will simply flow down one wire, through the load and back through the other wire. As equal currents will thus be flowing in the two wires

Fig.1:

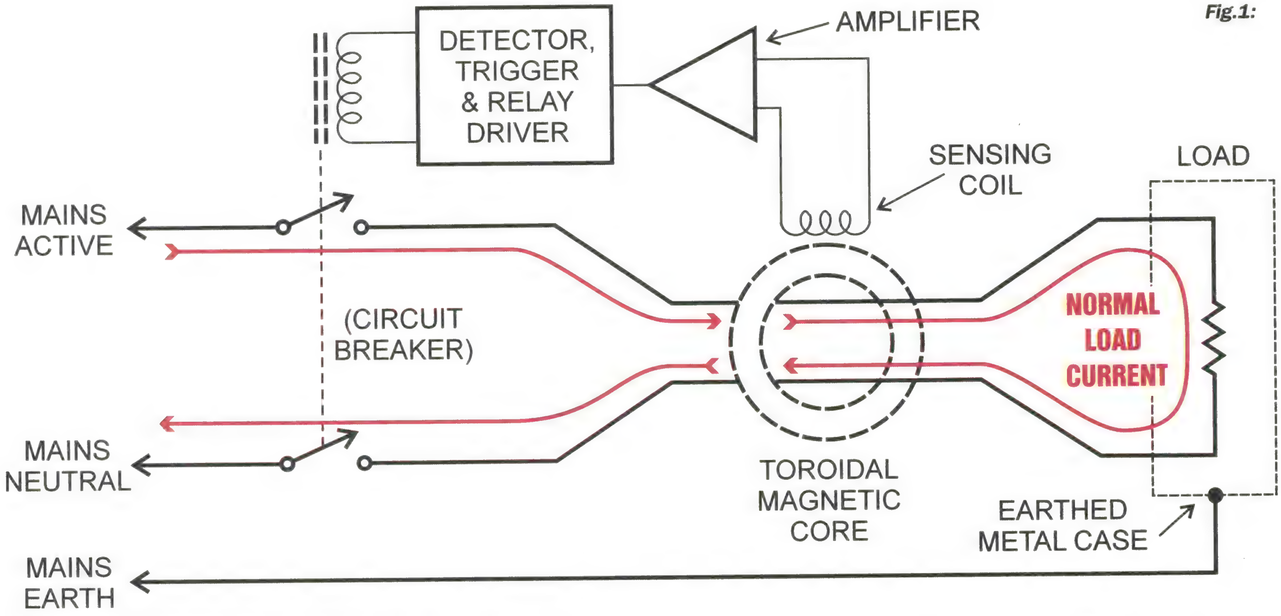


***Fig.1:** How an ELCB operates. When there's no leakage to earth, the fields from the active and neutral wires cancel each other out and the breaker isn't triggered.*

passing through the toroidal core, but in opposite directions, the magnetic fields generated by the two will cancel each other out and there will be no nett voltage induced in the sensing winding.

But should a fault develop in the load equipment, so that a small leakage current begins to flow to earth, this 'balance' between the active and neutral wire currents will be upset. Since some of the current in one wire will be flowing to earth, and not back through the other wire, the two fields will no longer cancel. As a result there will be a nett voltage induced in the sensing winding, which is amplified and used to trip the circuit breaker relay.

As you can see, the toroidal core plus its two mains wires and sensing winding acts essentially as a *differential current transformer*. The two mains wires are its primaries, and the sensing winding is its secondary. A voltage is only induced in the secondary if there are inequal currents flowing in the two primaries.

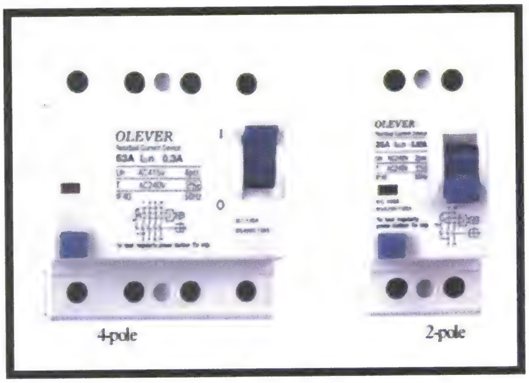
Most ELCBs are also fitted with a 'Test' circuit which introduces an artificial imbalance when a button is pressed, so the correct operation of the ELCB and its circuit breaker can be checked regularly.

Note that when used with appliances that are not normally earthed (i.e., 'double insulated'), an ELCB generally cannot detect a fault condition in the equipment as soon as it occurs; that's because there is no path for a leakage current to flow to earth — unless or until a path is created by the user. So with this kind of equipment the ELCB can only act to remove the power when a leakage current does flow.

This is why ELCBs are designed to remove the power as quickly as possible when a leakage current is detected. With double insulated equipment, any leakage current will probably be already flowing through the user — so the sooner the circuit breaker is tripped the better. A few tens of milliseconds could mean the difference between life and death.

A final note: an ELCB cannot provide protection against shocks caused by the user becoming connected directly between active and neutral, because this doesn't result in a current imbalance. So having an ELCB in circuit doesn't mean you can work on equipment with exposed wiring in 'complete safety'. If you accidentally connect yourself directly between active and neutral, you can easily receive a fatal shock without any adverse condition being detected by either the ELCB or the normal fuse/circuit breaker.

An ELCB merely improves your chances of surviving a shock due to an electrical fault. It certainly doesn't ensure complete safety. ea



***At left and above left:** You'll also find ELCBs in your fusebox, replacing the old-fashioned fuse or circuit breaker. They're a simple way to protect your whole house.*

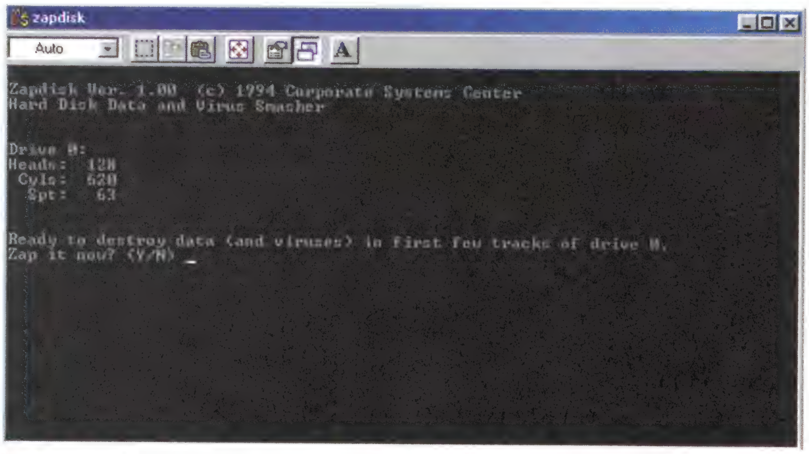
COMPUTER CLINIC

BY JEAN BAPTISTE CATTLEY

Dying drives and image viewers

Start praying

I recently had a startup problem with my system. It would go through the start sequence normally up until the point of displaying the desktop icons and playing its jingle. Instead, all that would happen is the hourglass figure would be displayed and the system would do nothing.



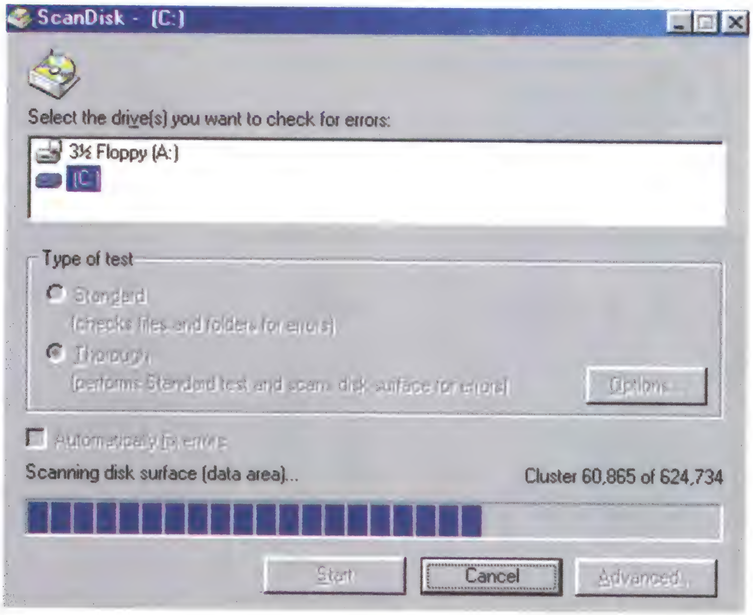
```
Zapdisk Ver. 1.00  (c) 1994 Corporate Systems Center
Hard Disk Data and Virus Smasher


Drive 0:
Heads:  128
 Cyls:  620
  Spt:   63


Ready to destroy data (and viruses) in first few tracks of drive 0.
Zap it now? (Y/N) _
```

Pressing Ctrl-Alt-Del resulted in the message 'waiting for program to close' dialogue box or similar. Restarting by using the reset button would usually result in going through the scandisk process and then a normal startup.

However this did not last too long and eventually only in safe mode for a while and after that nothing I tried would work. It even got worse to the point of only getting as far as the first screen with the Microsoft Windows emblem and the running blue bar at the bottom of the screen. Eventually all I got at boot up was 'Unable to find command interpreter'. Reinstalling Windows over the top made no difference.



Select the drive(s) you want to check for errors:

3½ Floppy (A:)
(C:)

Type of test

○ Standard
(checks files and folders for errors)

● Thorough
(performs Standard test and scans disk surface for errors)

☐ Automatically fix errors

Scanning disk surface (data area)... Cluster 60,865 of 624,734

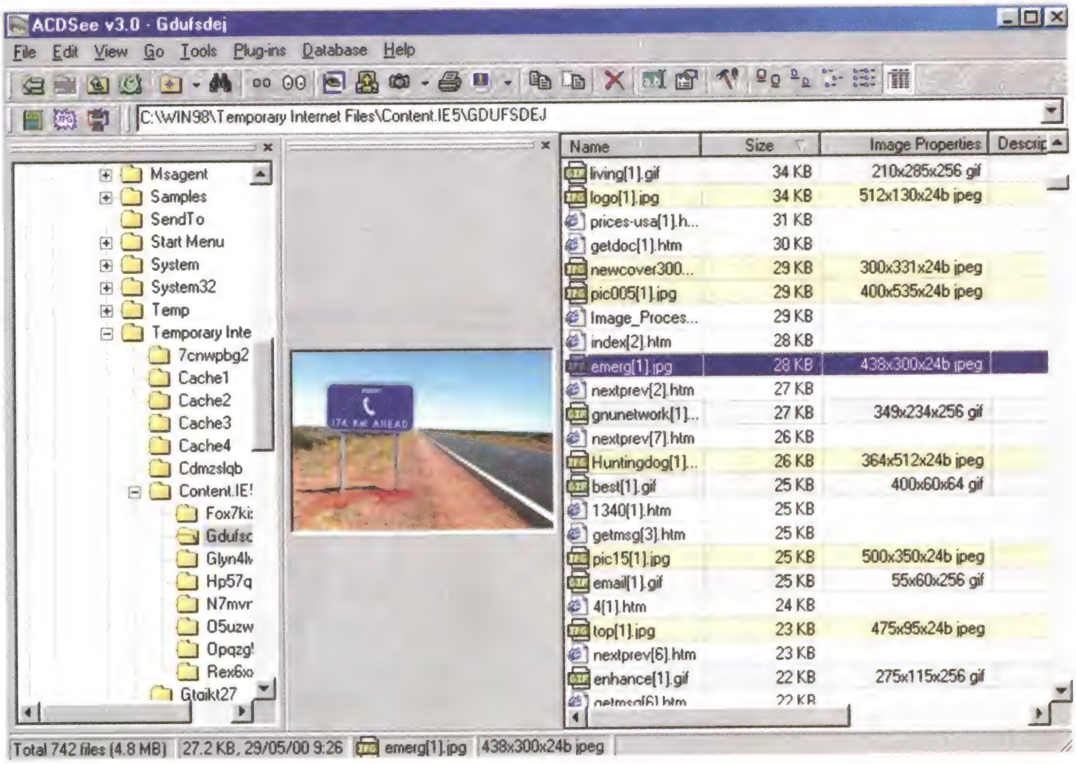
***Give that hard drive** a real workout with the thorough test in ScanDisk – but be warned, it takes ages...*

The only suspicion I have is in my Bitware communications program, as it refuses to install in my 'Program Files' directory, insisting on being installed on the root drive, however it hasn't caused problems like this in the past. At first I put all this down to being just one of those things but two nights ago my brother-in-law rang to ask if I had any ideas as to how to overcome exactly the same problem. They had installed Quicken on their computer and been using it fine then the same thing happened. I hope you can make some sense out of all this and enlighten us frustrated folk. *(E. Grygorowicz, by email)*

I can't say for sure, but it looks as though your drive has some read errors (or the IDE controller is playing up), or you are being hit by a virus. If the system had continued to fall over at one single point, I'd have suggest that a program in your startup group was crashing on you. However, as the problem kept getting worse, to the point of killing COMMAND.COM, progressive file corruption is the only sane possibility.

Drives do die eventually, so if I were you, I'd plug that drive into another machine (with a virus-checker installed!) post-haste and get any important data (including mail) off the drive for safe keeping. After that, try running a 'Thorough' scandisk on the drive, checking the surface for errors. If you get a significant number of errors... Well, it depends how desperate you are. Once drives start to die, they generally go downhill pretty fast. I wouldn't bother re-installing Windows on a drive that'll likely be dead in a month or two – but if you have no other choice, then I wish you luck.

Of course, if the drive comes up clean, then we have to work out what else could have been killing the thing. The next most easily-testable possibility is that a virus



Name	Size	Image Properties	Descrip
living[1].gif	34 KB	210x285x256 gif	
logo[1].jpg	34 KB	512x130x24b jpeg	
prices-usa[1].h...	31 KB		
getdoc[1].htm	30 KB		
newcover300...	29 KB	300x331x24b jpeg	
pic005[1].jpg	29 KB	400x535x24b jpeg	
Image_Proces...	29 KB		
index[2].htm	28 KB		
emerg[1].jpg	28 KB	438x300x24b jpeg	
nextprev[2].htm	27 KB		
gnunetwork[1]...	27 KB	349x234x256 gif	
nextprev[7].htm	26 KB		
Huntingdog[1]...	26 KB	364x512x24b jpeg	
best[1].gif	25 KB	400x60x64 gif	
1340[1].htm	25 KB		
getmsg[3].htm	25 KB		
pic15[1].jpg	25 KB	500x350x24b jpeg	
email[1].gif	25 KB	55x60x256 gif	
4[1].htm	24 KB		
top[1].jpg	23 KB	475x95x24b jpeg	
nextprev[6].htm	23 KB		
enhance[1].gif	22 KB	275x115x256 gif	
getmsg[6].htm	22 KB		

Total 742 files (4.8 MB) | 27.2 KB, 29/05/00 9:26 | emerg[1].jpg | 438x300x24b jpeg

ACDsee *is perhaps the ultimate image viewer – it can handle any file format known to man (including EPS!), and it prints thumbnails too...*

was eating your files; run up that virus checker, and do a thorough scan of the drive. If you find anything... You most likely have the answer. Call me paranoid, but I never trust virus checkers to clean drives completely - once you have your data, format the thing, and give it a blast with Zapdisk (**www.websmithing.com/zapdisk.htm** – incredibly dangerous, not for the faint-of-heart - it writes zeroes to the first few entire tracks of your drive.) for good measure. Once that's done, reinstall windows from scratch, and you should be fine.

If that *still* isn't it, then we're down to the weird stuff. Reinstall your system from scratch – it needs it anyway – and if the problem comes back, you'll have to do some serious testing. Try the booting the drive on different hardware, and see if the problem continues. If it doesn't, then you could have a hardware-related problem. Try pulling everything out of your original machine except the video card, RAM and hard drive, and try booting that. If that works, keep adding cards one at a time until the problem comes back. When it does, you know you have a problem or conflict with that card. Fixing it is getting a little too hypothetical for now, but if you find anything, let me know. I hope this helps, and good luck!

Just plain weird

Speaking of strange problems, I have one that has me absolutely stonkered, and I thought I may as well throw it open. A couple of weeks back, I turned off my computer overnight - something I virtually never do. In the morning, the thing refused to start up, no video, no disk activity, nothing. After stripping it down to the bare board, video and RAM, with no luck, I assumed I had a real hardware failure.

Here's the funny thing, though: I tried replacing the components with ones from a known-good identical (K62-300) system that had been made redundant a few days previously – even after I had replaced every single component, including power supply, it still only starts up one time in three... Am I to believe that two perfectly-working systems both died within three days of each other? Has the Y2.005K struck? I've seen some bizarre failures in my time, but this absolutely takes the cake. If anyone has any ideas, I'd love to hear them.

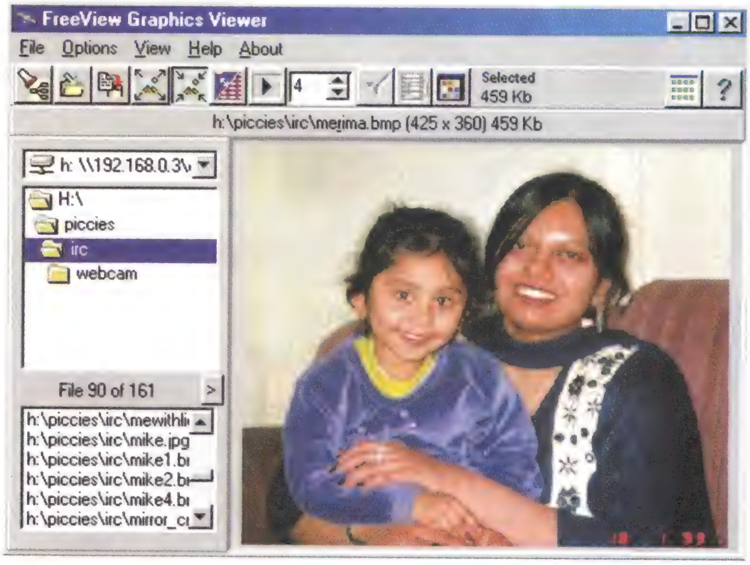
Imaging that

Software pick of the month is Freeview, a rather nice little image viewer. If you have a lot of images on your system, then loading them individually into Quick View or IE is time-consuming and laborious. Freeview is a nice, simple little windows app that displays virtually all types of image files quickly and easily

There's options to zoom, tile, generate thumbnail views and set as wallpaper – we're not talking earth-shattering technology, but a very handy little utility to have around. You can easily walk through directories full of images, perform basic file management – everything you could want. As the name would suggest, of course... it's free! Grab it now at **ftp://ftp.cdrom.com/.3/simtelnet/win95/graphics/freeview.zip**.

Of course, if Freeview isn't enough for you, then go with the best: ACDSee32 V3.0 is simply the finest image viewing/browsing/manipulation software ever produced. There is nothing better out there, and there never will be, until the next version is released. The user interface is fast and completely intuitive, the rendering quality is fanstastic, even at high zoom levels, and there's a huge array of filters and tools thrown in.

Yes this is a shameless plug, but I don't care. I'm not often impressed this much by software, but when I am, I tell people about it. And in case you're wondering,



h:\piccies\irc\merima.bmp (425 x 360) 459 Kb

h:\piccies\irc\mewithli
h:\piccies\irc\mike.jpg
h:\piccies\irc\mike1.b
h:\piccies\irc\mike2.b
h:\piccies\irc\mike4.b
h:\piccies\irc\mirror_c

***Freeview** is , er, free, and is great for managing your image collection.*

no, it's not free. It's US$49.95 per license, but if you need to deal with a lot of images on a regular basis, it'll pay for itself in no time. Check it out now at **www.acdsystems.com**.

Sticky Web

Since I've moved to Windows 98, the View as Web Page option just won't go away. I keep turning it off, but it keeps turning itself back on no matter what I do. This is annoying, as my machine is fairly slow to start with, and the Web Page stuff makes it even slower. Is there a way to kill it completely?

(S. Horowitz, by email)

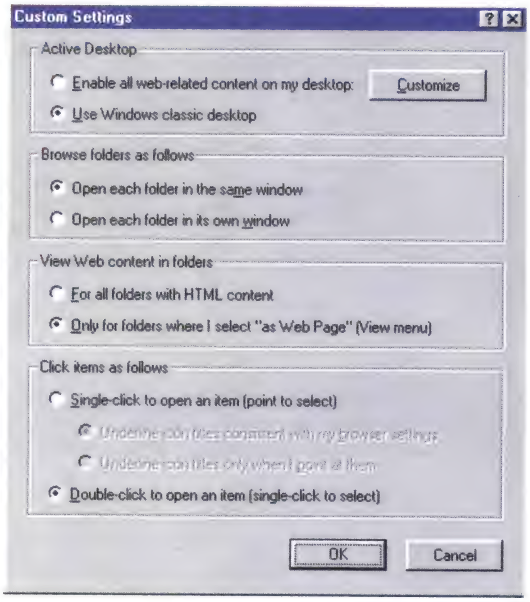
Heh. Irritating, isn't it? Windows gets downright loopy when it comes to saving folder settings, sometimes saving them, sometimes not – you're never sure just what you'll get. It's enough to drive a person insane. However, I've come up with a detailed set of superstitions that should work for most people. To turn off the web view, and set up a single, consistent view in explorer, follow these steps:

Close all Explorer windows except one, go to the View menu and disable 'View as Web Page'. While you're at it, select the display and sorting options you want. I find the Details view the most useful in the long run, but your mileage may vary.

Now go to View | Folder Options, select the Custom radio button and then Settings. Set up the options as shown in the screenshot on the upper-right, and hit OK to continue. Now go to the View tab, and ensure the 'Remember each folder's individual folder settings' checkbox is disabled. You'll also want to 'Display full path in title bar', show 'All files', and *not* 'Hide extensions for known file types'. If your machine is painfully slow, you'll also want to disable 'Show window contents while dragging', as well.

Hit Apply, then the 'Like Current Folder' button. Hit OK, close the Explorer window – and open up My Computer again. With any luck, you should have the view you selected, and it should be applied to all folders.

***Tick the right boxes**, press the right buttons, say the right magic words, and you can set up your windows just the way you want them. Probably.*

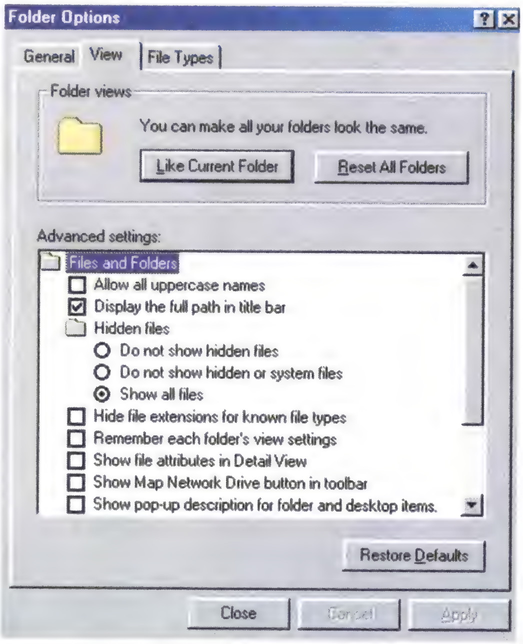


Active Desktop
○ Enable all web-related content on my desktop:
● Use Windows classic desktop

Browse folders as follows
● Open each folder in the same window
○ Open each folder in its own window

View Web content in folders
○ For all folders with HTML content
● Only for folders where I select "as Web Page" (View menu)

Click items as follows
○ Single-click to open an item (point to select)
● Underline icon titles consistent with my browser settings
○ Underline icon titles only when I point at them
● Double-click to open an item (single-click to select)

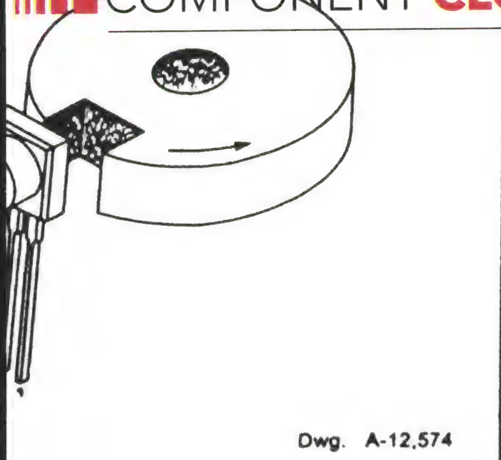


Folder views
You can make all your folders look the same.

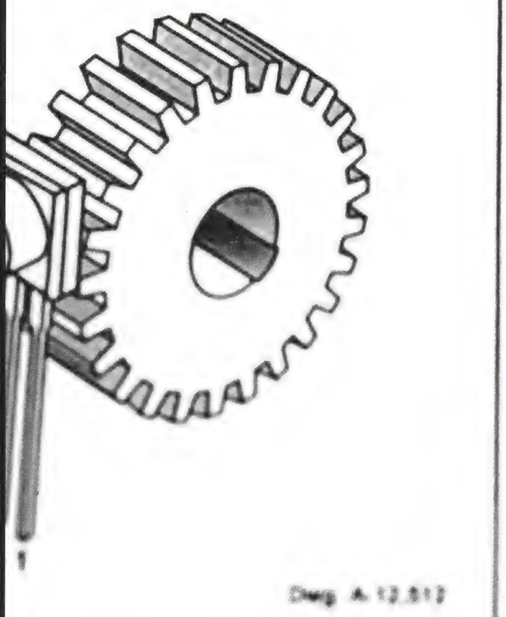
Advanced settings:
Files and Folders
☐ Allow all uppercase names
☑ Display the full path in title bar
Hidden files
○ Do not show hidden files
○ Do not show hidden or system files
● Show all files
☐ Hide file extensions for known file types
☐ Remember each folder's view settings
☐ Show file attributes in Detail View
☐ Show Map Network Drive button in toolbar
☐ Show pop-up description for folder and desktop items.

You might find that Web View needs to be manually disabled on special folders such as Control Panel, but these changes *should* now stick. If not, try waving a dead chicken over the computer, and sacrificing a RAM to Bill gates. (Ok, so it was a bad pun. So sue me.) **ea**

NOTCH SENSOR

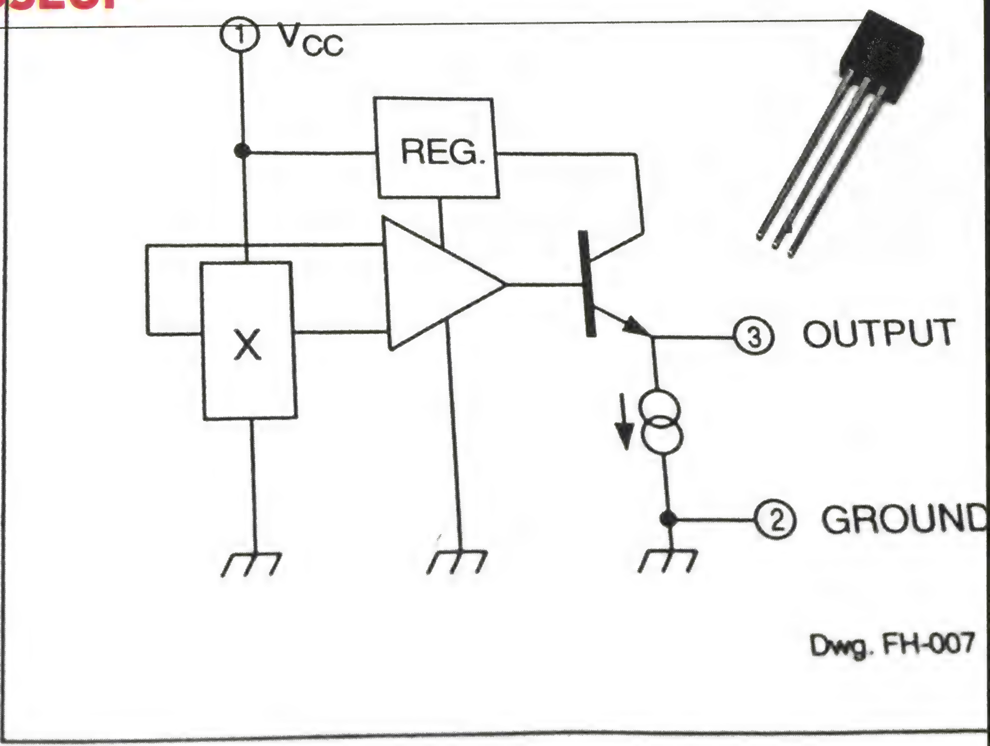


AR TOOTH SENSOR

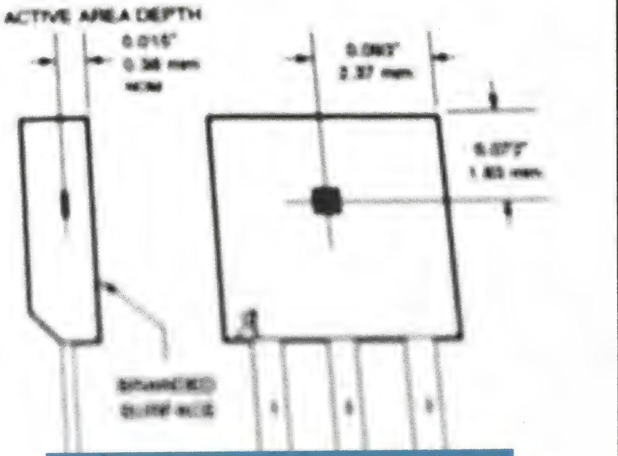


RENT MONITOR

FUNCTIONAL BLOCK DIAGRAM



SUFFIX "U"



UGN3503

HALL EFFECT SENSOR

Hall-effect sensors accurately track extremely small changes in magnetic flux density-changes generally too small to operate Hall-effect switches. They are often used as motion detectors, gear tooth sensors, or proximity detectors, and they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.

The UGN3503U includes a Hall sensing element, linear amplifier, and emitter-follower output stage. As the Hall cell and amplifier are on a single chip, the problems associated with handling the tiny analogue signals are minimised.

You'll find the UGN3503U at your nearest Jaycar electronics store (Cat # ZD-1902) for $3.35, and if you would like more info, you'll find the datasheet with full specifications at **www.allegromicro.com/sf/3503/index.htm**. ea

FEATURES

- Extremely Sensitive
- Flat Response to 23kHz
- Low-Noise Output
- 4.5 to 6V Operation

SPECIFICATIONS

Operating Voltage	4.5 - 6.0 V
Supply Current	9mA
Quiescent Output Voltage	2.5V
Sensitivity	1.30mV/G
Bandwidth (-3dB)	23kHz
Output Resistance	50Ω

BY ROGER JOHNSON

Four-Valve Sets - Part 2

This month we're continuing our look at four-valve receiver designs of the late 1920s, moving to some of the more interesting designs of that era. Overall, four-valve radios would of course encompass just about half the radios ever made in the valve era, especially in Australia.

IN THE EARLY to mid 1920s both Britain and America seemed to have reduced numbers of four-valve radios in their range, but whereas America opted for five, six and seven-valve sets, Britain seemed to favour one, two and three-valve radios, with lesser numbers of designs with more valves. This is a fairly broad generalisation and any amount of exceptions can be provided, but anecdotally, it appears to be the case.

It's not that easy to find samples of British four-valvers in this country from the mid 1920s. However there are many Australian department store brands, and many were home built. In the latter 1920s, if the advertisements in the popular magazines are a guide, the preference was to America for imported radios of all descriptions.

When referring to electric sets, do we consider the rectifier as a valve? Up until the early 1930s, a 'valve' meant an amplifying valve, and so a rectifier was excluded in the valve count. But valve manufacturers and technical people pointed out that the criteria should be whether or not it is a thermionic vacuum tube, and not merely an 'amplifier'. Hence the rectifier became included in the valve count, no doubt to the delight of many a salesman.

For the purposes of this article, though, we will use the prevailing attitudes of the day and exclude the rectifier from the valve count.

Battery triode circuits

Even toward the late 1920s, circuits using battery triodes were still popular. One such circuit using the standard tuned RF and regenerative detector is the 'Bush 4 Valver' described in *The Listener In* for June 12th 1929.

As the name implies, this was the set for bush 'cockies' and efficient antenna coupling went a long way to achieving the best performance. So in this slightly different circuit (Fig.1) the antenna is connected via a two-position switch to either a tap towards the earthy end of the tuning coil, or to a vario-coupler.

The RF amplifier is coupled to the detector tuning coil via a small value capacitor, with an RF choke from the plate to HT. The text describes this as 'the choke-fed tuned anode system'. Regeneration is from what is a not-quite-oscillating Hartley circuit. The detector tuning coil (3) is centre tapped for the earth return, and the tuning capacitor (5) is connected across the entire winding. The anode of the detector stage is fed back into the bottom of the coil via a 100pF reaction capacitor (6).

Just in closing, this circuit really *was* intended for the 'cockies'. The text claimed that selectivity should give way to sensitivity, and that loudspeaker operation is obtainable from merely 90 volts HT in order to reduce costs.

Actually *The Listener In* for June 12th 1929 was a boon in preparing this column, for it contained three four-valve circuits, all different, and some incorporated new techniques.

Another circuit for the home constructor was described in the same issue, called the 'Home Four Valver'. This is another example of an 'all triode' circuit, but technically some features are somewhat dated. Although four valves are used, it is in reality a three-

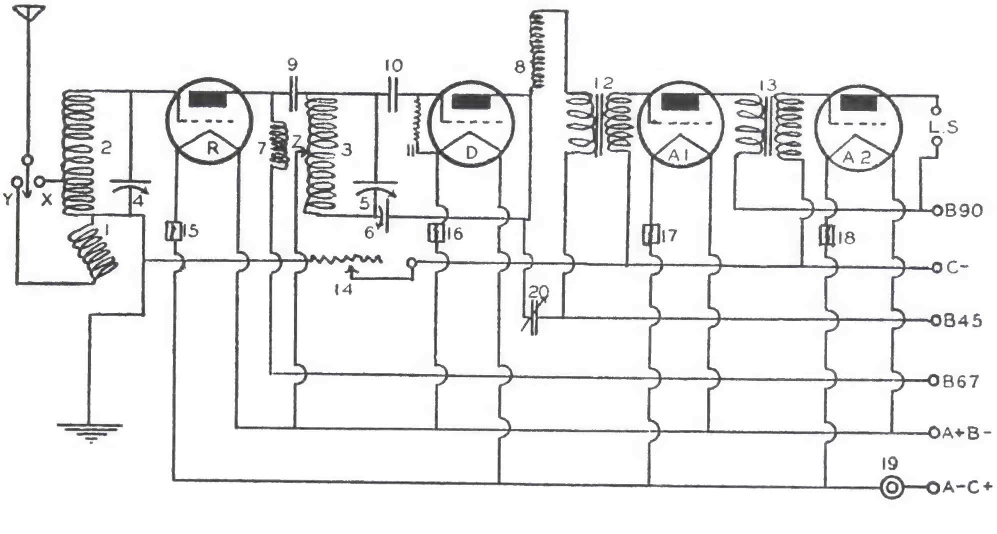


Fig.1: The 'Bush Four Valver' described in The Listener In for June 12, 1929. It was designed to achieve high sensitivity for the 'man on the land'.

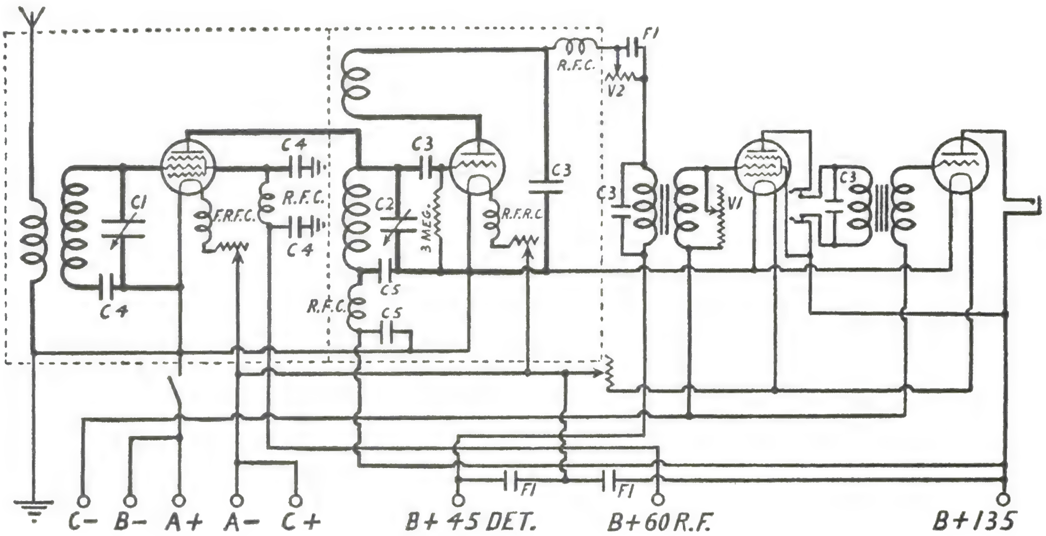


Fig.2: *A rather complex short wave set using screen-grid 'penthodes', also described in The Listener In for June 12, 1929.*

valve set consisting of a single stage regenerative detector and two transformer coupled stages of audio. The fourth valve is the dubious 'antenna coupler' seen in so many American sets from about 1925. It is an untuned RF amplifier intended to isolate the antenna loading effects from the tuned circuit. In this capacity it has a stage gain of not much more than unity.

The description of 'all triode' is given in quotation marks, for that is how the circuit appears. The two audio stages are shown as triodes, but reference to the parts list shows the audio stages as penthodes (sic). Even the wiring diagram shows UX sockets. So how are pentodes used?

The very earliest pentodes had a UX base, in which the pins were connected as a triode. But the 'extra' screen grid was connected to a grub screw mounted on the valve base. This was done to facilitate the incorporation of a 'power valve' i.e. a pentode into the final stage without modification to the existing wiring. You merely connected a wire from B+ to the screen terminal.

There are some refinements shown in this circuit. Reaction is controlled by a 6000 ohm pot in series with the 1st AFT and the B+ end of the reaction winding. It is used to vary the anode potential, and hence the stage gain, and ultimately the amount of RF fed back by the reaction winding to the tuned winding.

Another refinement is a 'volume control' R7 shunted across the secondary of AFT1. With a transformer coupled pentode, which incidentally is not the wisest thing to do, and a further pentode output stage, this set could beef out the best part of 1/4 watt, more than enough for a horn speaker. However, one would think that R7 is to prevent overloading and hence distortion of the output, rather than too much sound.

Screen grids and 'penthodes'

The term 'penthode' was the very early spelling of 'pentode'. Why the 'h' was included is anyone's guess. In any case the term was initially only used for audio or power valves. For RF applications, these valves were described as a 'screen grid'. This is an accurate description, because that is exactly what they were. They did not have a suppressor, either external or internally connected, which has been verified by examining dud specimens. So functionally they were really a tetrode, although that term only seemed to be adopted at a later time.

The final circuit from *The Listener In* for June 12th 1929 is for a short wave receiver (Fig.2). Now this is another interesting development — listening to short waves. The stations which were logged on this receiver were RFM Siberia on 70m, W2XAF New York and PCJ Eindhoven on the 31m band (amongst Australian hams of the day), and the American KGO and W2XG along with stations in the 'Dutch East Indies' (i.e. Indonesia).

In this circuit a screen grid RF amplifier is used to dispense with the need for neutralisation (which could be difficult at higher frequencies), followed by a triode detector, then transformer coupled to a pentode audio stage, which is turn transformer coupled to a triode output stage! This was included so that the set could operate with either three or four valves.

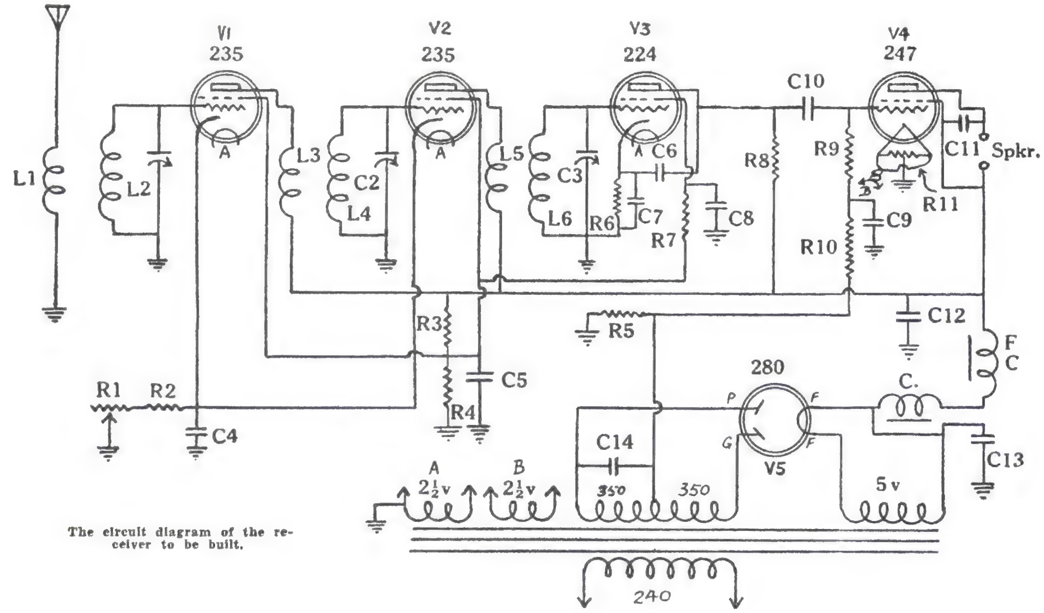
Once again, reaction is achieved by means of a potentiometer (V2) instead of a variable capacitor, and a volume control is included by shunting the secondary of AFT 1 with a high value pot (V1).

The RF and detector stages are enclosed in separately shielded compartments, and RF chokes are included in the filament circuits. Both stages are also bypassed in the screen and anode circuits. One presumes that the elaborate shielding was insufficient, and that stray RF tended to be transmitted via the wiring to any or all of those various electrodes, causing instability.

Quite elaborate instructions are given on bending the aluminium sheet into the rectangular box and partition which forms the shielded sections, but the photograph would suggest that the compartment is definitely made by a sheet metal worker. The text also describes how to fix all this metalwork to the chassis: with 'Meccano' brackets (why not?). Although a chassis is described, most of the wiring is actually above the chassis, with just a couple of pots and the old 'rectangular can' type bypass capacitors mounted beneath. Baseboard wiring was still firmly entrenched.

The tuning capacitors have been modified for a maximum capacity of about 150pF to allow ease of tuning, and coil details are given for five tuning ranges

Fig.3: *The '1932 Advance' described in Wireless Weekly for January 8, 1932. It's fairly typical of the last generation of all electric four-valve TRF sets.*



— covering from 84 metres down to 13 metres. However only the number of turns is given, and no details regarding the spacing of the windings or the spacing between the windings themselves. The coils are all wound on UX valve bases, which explains why there is no RF/detector primary.

Perhaps it was assumed that this was not a set for the novice constructor, and that the operator would have had some prior experience in winding the coils and constructing and operating it. The valve types are A442, A415, B443 and B405.

Early electric sets

Referring again to *The Listener In*, there was a four-valve electric set in the October 23rd issue. This circuit denotes the beginning of the brief interval of the 4/5 valve TRF configuration popular for two or three years up until 1931, when the autodyne superhet became very popular and dominated electric receivers until the introduction of the pentagrid converter.

The 1929 circuit is a little unorthodox in that it has a first stage RF amplifier in which there is no tuned circuit at the grid. The tuning circuits are a tuned anode/tuned grid (otherwise known as band pass tuning) in the second stage and again in the detector stage.

This receiver requires a four-gang tuning capacitor and coil details which are not given, but *are the same as the battery circuit described a couple of weeks ago* (terrific!). The circuit also includes reaction, which is a dubious inclusion in a set with four tuned stages. One would think that sensitivity and selectivity, even with home wound solenoid coils, would be more than ample in this circuit without reaction. The detector stage is a grid-leak triode, which is then transformer coupled to a pentode.

The article gives an explanation of how grid bias is obtained by cathode resistors which really has to be read to be believed. One could almost be forgiven for concluding that the author of the article didn't have a clue what he was talking about. Not only that but there's no cathode resistor in the output stage anyway, to give any bias at all.

The construction details are also remarkably scant. It seems that this set was to be built on a timber base, covered with copper sheeting to act as shielding and a convenient earth for the wiring. Again, the three RF stages are placed in compartments, and the power supply is not shown.

Later TRFs

The same criticism could not be made of the '1932 Advance' described in *Wireless Weekly* for January 8th 1932, and shown in Fig.3. This circuit must have been the very last of the all-electric TRFs, because there is a little block insertion in the column proclaiming 'Next week - special superhetrodyne number'.

The 1932 Advance circuit is very typical of many of the commercial TRFs of the day. There is not a lot of variation in these sets, with the possible inclusion of a voltage divider where the volume control, together with the detector screen, is taken from the 35 volt tap.

The circuit makes a very good guide to rebuilding an unidentified derelict chassis that has a few bits and pieces missing from it. Looking at the circuit, we see nothing complex or unusual. There are two stages of variable-mu RF amplifiers type 35, an anode-bend detector type 24A and a type 47 pentode output. The anode-bend method of detection is better than grid leak detection when the input voltages are high.

Notice that with this type of set there is no band-pass tuning or a four-gang tuning capacitor to complicate things.

One departure from the system used by many set manufacturers is the inclusion of a 250,000 ohm anode load resistor (R8) where an audio choke is more commonplace. The choke has a lower DC resistance, and hence the valve can operate at a higher anode voltage and thereby has a higher gain. The inductive reactance of the choke at audio frequencies forms the anode load, and not merely the DC resistance.

In conclusion, four-valve sets were plentiful and varied in Australia in the late 1920s and early 1930s. Those described here and last month will hopefully have given you a brief insight into the variety available. ea

INFORMATION **CENTRE**

BY PETER PHILLIPS

MP3 sound, and using technology that's **100 years old...**

It's an ever changing world, and this month sees a few changes to this column. Our new format for Information Centre means that we can present more reader's questions, and, of course, answer them.

Help, I'm colour blind

Did you know that many colour blind people have difficulty differentiating between green, yellow and red LEDs? In fact many colour blind people have problems when dealing with modern electronic equipment, simply because the designer never thought about it. I was recently reminded of this when a colour blind friend showed me the latest in vacuum powered delivery systems he had to operate. It had a smart control panel with a number of tri-colour LEDs and a legend explaining what each colour represented. But my friend had no idea what all the LEDs were showing, simply because he was colour blind.

Many colour blind (or colour defective) people see quite a few colours as being identical, discriminating between them only through their different luminosity (brightness). Colour blindness mainly affects males (about 7% of the population) and the nature of the problem can vary between individuals. We won't go into details about the various forms of colour blindness, but surely it's about time it became an issue.

After all, there's a proliferation of equipment around today that's a nightmare for colour blind users. It's all very nice to have a beaut front panel with tri-colour indicators or colour-coded knobs and buttons, but if this limits its use, what's the point. Furthermore, it can be dangerous. And unnecessarily so, which is the point I want to make on behalf of those who are colour blind.

MP3 – just what do we miss out on?

Firstly, your new look format loses nothing over the old format, so you won't lose this reader. From what I understand, MP3 files are compressed by excluding inaudible frequencies (among other things). Could you clear up a conception I have about these 'inaudible frequencies'. I was under the impression that even though you can't hear them, they do add a quality to the sound that would otherwise not be there. By going for MP3 I feel it's another step towards reducing the quality of music as we understand it.

(George Briansky, email)

The question of sound quality is one that has raged in this maga-

Wireless mouse

It's not often I have good things to say about Microsoft, but this time I have nothing but praise for a new type of Microsoft mouse you might not have heard of. I'm referring to the Microsoft wireless mouse. It's called a cordless wheel mouse, but unlike other wireless mice, this one uses a radio signal to communicate with the computer, not infrared.

Apart from getting rid of that annoying lead, you can use this mouse anywhere around the computer. For instance, sometimes I need to have the mouse near the scanner while I hold a document flat on the scanner bed. Previously I had to deal with the mouse and its lead, now I just bring the mouse itself over to where I'm working. As well, the driver software makes very good use of the wheel, allowing you to scroll through any Windows screen, including disk file lists, wordprocessor documents, spreadsheets etc.

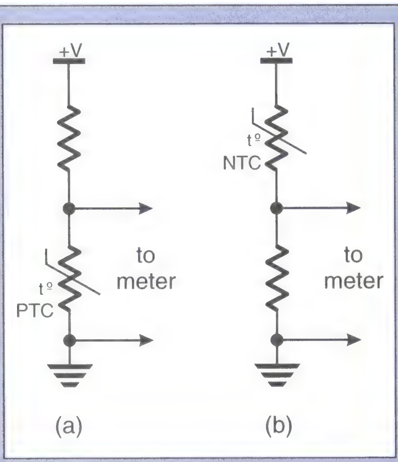
I paid $75 for it at a local computer shop, and was amazed to find that it worked the minute I plugged it in. That is, it works from most mouse drivers, which means you are not without a mouse during the setup process. It has a small receiver that sits out of sight, the receiver simply plugging into the mouse socket. The mouse is powered by two AAA batteries, which in my case last around three months.

And to eliminate strain when using the mouse (any type), I also highly recommend using a silicon gel type hand rest. I bought such a device a few months ago in the US, but they seem to be available in Australia. These two items, with a total cost of less than $100 have made such a difference to my computing activities that I thought I should let *EA* readers know.

Using the April 2000 LCD panel meter to display car engine temperature

I want to put a digital display for water temperature in my car. At the moment it has a temperature gauge (12V) operating from a resistive sensor. The resistance of the sensor is 280 ohms when the engine is cold, 100 ohms at normal running temperature, and 40 ohms under heated conditions. Can the April 2000 LCD panel meter project be used as a temperature gauge in a car, and if so, how do I do this?

(no name, email)



Measuring temperature using a digital meter module. (a) Connections for a PTC thermistor, (b) for an NTC thermistor. Note the need for a regulated supply voltage.

The panel meter can be used to display temperature, providing the input to the meter is a voltage. In a typical setup you would have a temperature sensitive device (thermistor) in series with a fixed value resistor, with the combination connected across a regulated voltage and earth. The input to the meter is then taken from the junction of the thermistor and resistor, and earth. As shown in Fig.1, if you use a positive temperature coefficient (PTC) thermistor (resistance increases with temperature), you'd connect the thermistor to earth, and for an NTC, the fixed resistor goes to earth. That's the principle anyway.

But in your car, you have an NTC thermistor with one end connected to earth, which is wrong for your needs. Instead, you would need to either rearrange the circuit as per Fig.1(b), which is probably difficult, due to the construction of the existing thermistor, or you would need to install another thermistor as per either diagram in Fig.1. This is by no means impossible, as you just need to source a suitable thermistor.

The next thing you need is a 5V regulator, to power the meter from the car's unregulated 12V supply. Then it becomes a matter of calibrating the system. The meter circuit has an adjustable reference voltage, which can form part of the calibration. To get the system into range, you would need to choose a suitable fixed value resistor, which would depend on the resistance of the thermistor.

Another way might be to use a thermocouple, as done in digital multimeters able to measure temperature. Here you would need to set the meter's reference voltage to quite a low value.

zine for years. Valve sound versus transistor, vinyl versus CD, and now MP3 versus the world. The fact is George, one minute of MP3 sound takes around 1MB of disk space, compared to 12MB for CD quality sound, so obviously there's quite a bit missing.

But just how much this affects the sound quality depends on the type of music, the system you're hearing it on, your own hearing, the volume level and so on. For instance, some people will argue that a sound system should have a bandwidth of 200kHz or more so it can reproduce inaudible harmonics that were present in the original sound. True, but would we really hear the difference? Some might, but most people don't. And that's where MP3 fits, into a market where sound quality has to be good, but not to the same extent as that demanded by the true audiophile.

If you do an A-B test between MP3 sound and the same piece from a well recorded CD, you will probably hear differences, although they might be hard to identify. For example, you might find you get 'listening fatigue' with too much MP3, or you'll wonder about the clarity and focus. So yes, you're right. Take anything away from the original sound and some people will hear it. Others just don't care, as they are listening to the music, not the sound or the sound system. I have not embraced MP3, as hifi is one of my interests. But from what I have heard, there's no doubt I could easily enjoy MP3 recordings, as the sound quality is pretty damn good, despite the compression.

Using LM334s to measure air speed

One quite reliable (but rather expensive) method of measuring air speed is with a hot wire anemometer. The heart of the design is a Wheatstone bridge,

where one of the resistors is a filament. In operation, the filament is heated by current passing through the bridge. Air passing over the filament causes it to cool. The extra current drawn by the filament to maintain its temperature is measured, allowing a value of air speed to be calculated. The major disadvantage of this method is the need for a very fine filament, usually a film or fine wire (approximately 10 microns across), making it very expensive. Consequently hot wire/film anemometers can cost up to $10,000.

It's also possible to build an anemometer that uses this principle, but with LM334 ICs. One set is heated by the current passing through them, the other set is at ambient temperature. It will use more power, and take longer to respond however. There are lots of internet sites on this topic by the way.

(Phil Cole, email)

The hot wire anemometer has been around for a while, and is mainly suited for low air speeds. But as you say Phil, they are not cheap. I'm intrigued though with the idea of using LM334 ICs instead of resistors. This IC is an adjustable current source (5uA to 10mA) in a TO92 case and costs around $3.00. I assume the current passing through the IC varies with a change in temperature, which doesn't say a lot for the regulation of the device.

Getting the most out of 100 year old telephone copper lines

Over recent issues, we have been discussing Telstra's 'black box' technology that is currently being promoted as a way of getting a second phone without using a second phone line. There have been a number of letters on this topic, and this one goes into quite a bit of detail about the history of these devices:

I'm a communications consultant with some experience with the pair gain systems described in July. Firstly, there are analog and digital pair gain systems used primarily to provide multiple circuits over a fixed number of copper pairs. There are (or were) two basic types of analog pair gain systems: a 1 plus 1 and a 1 plus 4. The 1+1 provides one derived circuit, which is modulated at a frequency(s) above 19kHz (from memory) over the baseband copper circuit, with appropriate filtering to stop this signal being evident on the copper circuit. The derived circuit is full duplex and provides a VF bandwidth of around 4kHz, which is ok for phone calls but not so flash for data calls.

The 1+4 provides a dual simplex circuit, ie two separately modulated circuits; one for Tx and one for Rx. To my knowledge these are not used much now, and were mainly used to provide four wire Datel services where a customer didn't have enough lines for the system. I know it doesn't make sense to have a 1+1 providing a 1x2 wire circuit and a 1+4 to provide a 1x4 wire circuit, but there you are.

The filtering for the derived circuit also substantially limits the copper circuit's bandwidth when the modulation methods for the current V.90 standard are taken into account. A point that needs to be kept in mind though is that the only guarantee that Telstra provides for data over the standard analog phone network is that of being able to connect and transmit data at 2400 bits per second and no higher. (Even though Telstra is one of the bigger tier one ISPs and advertises 56k V.90 connectivity!)

I have never heard of an analog version of an NT1. The OnRamp NT1 is a digital network termination device designed to terminate the copper circuit to the local ISDN exchange port. The OnRamp service is a basic rate ISDN service complying to ETSI standards, and provides all the benefits of a dedicated, circuit switched, digital service.

The output of the NT1, called the S interface, is a four wire, time division multiplexed stream designed to be used in a bus configuration with up to eight (I think) devices connected to the bus at one time. The only drawback for home use is that devices connected to this bus need to be ETSI ISDN compatible.

The data stream consists of two 64 kilobit/second B (bearer) channels and one 16 kilobit/second signalling channel for call setup, metering notification, CLIP (calling line identification presentation) etc. This signalling channel might be able to be used for user-to-user messaging (for feature transparency between PABXs and the like) and X.25 connectivity into AUSTPAC, the Telstra public X.25 packet switched data network.

So there you have it. A brief look into the world of getting the most bandwidth out of 100 year old cable technology. I have not touched on RIM (remote integrated multiplexer) technology, which is really good stuff, or the discrete digital pair gain systems, but I believe they are capable of far better performance than the analog gear. (name not included, email)

Software for the Video Text Overlay Module

I recently built the PC-Driven Video Text Overlay Module project which seems to work really well. However the software supplied is very basic, as mentioned in the article. Do you know of any software for this system which would allow me to simply enter the text, rather than writing a computer program?

(Roderick Breis, email)

The software to drive this project is, as you say, rather primitive, and the author of the article hopes someone might develop a program to do just what you ask Roderick. At this stage we are not aware of such a program, but it would pay you to check out the ST Microelectronics website just in case. The IC driving this project is rather like a microcontroller, with registers that need to be programmed. So there's more to it than just a bit of simple programming unfortunately.

If any readers are aware of the type of software Roderick is asking for, please let us know. It would certainly enhance the use of this interesting project.

August's What??

Turn on switch 1 for a few minutes, then turn it off. Turn on switch 2, and go upstairs. Obviously the light that is on is controlled by switch 2. Now feel the other two lamps. The warm lamp is controlled by switch 1, the cold one by switch 3. Simple!

That's the last What?? question for now folks. My sincere thanks to all those who sent in questions, who contested the answers and who just participated. ea

$10 WONDERS

BY OWEN BISHOP

Reaction **tester**

Are you quick off the mark? This gadget will tell you just how fast you can respond. It measures your reaction time to the nearest hundredth of a second, and if you think you can go faster, you can easily crank it up to a level that even Superman couldn't match...

THIS REACTION tester is very simple to operate — it has two pushbuttons: one to start, one to stop, and a display of 20 LEDs to indicate the reaction time. The LEDs in the top row light up one at a time, scanning from left to right. A complete scan takes 0.1 seconds. In other words, each LED lights up for 0.01 seconds, or 10ms. The bottom row scans at a tenth of this rate; each scan takes 1 second, and so each LED is on for 0.1 seconds, or 100ms.

Thus, the time is read by looking to see which LED is on in each row. This gives a reading from 0.00s to 0.99s. This covers most reaction times that you are likely to want to measure. However, if you want to measure longer times, it is easy to watch the bottom row and count the number of scans. Just add one second to the time for each complete scan through the bottom row of LEDs.

To use the timer, sit opposite your friend with the white button on your side. The LEDs are busily scanning. All very impressive! Then your friend presses *and holds* the red button. Scanning stops and the LEDs at the left end (as seen by you) of each row light up. This indicates 0.00s. To initiate the timing sequence, your friend releases the button *without warning you*. As soon as you see the LEDs beginning to scan, you press *and hold* the white button. This halts the scan immediately and you read the time from the two lit LEDs. Remember, the LEDs count from 0 to 9, not from 1 to 10. When you have read the time, release the white button and scanning continues, waiting for the next trial.

How it works

Timing is provided by IC1, a 7555 CMOS timer wired as an astable. VR1 allows you to adjust the timing to compensate for errors in the value of the capacitor. The timer drives the decade counter IC2, which has 1-of-10 outputs — which means that only one of its 10 outputs is high at any one time. At each rising edge of the signal from the timer, the counter is incremented by 1 and the outputs go high in order 0, 1, 2, 3, ... , 9, repeating.

The counter operates only when its Reset input (pin 15) is low. It is held low by a pull-down resistor R4. When the red button (SW1) is pressed, the RESET input becomes high. This resets the counter to zero, and output '0' goes high. Counting does not start again until the button is released.

IC2 has an output called the CO (Carry Out) output. This goes high for counts 0 to 4 and low for counts 5 to 9. Therefore, this output changes from low to high as the count changes from 9 to 0. The rising edge increments the second counter IC3. This counter is identical to that of IC2 but, since it is incremented only as the first counter goes from 9 to 0, the second counter runs at only one tenth of the speed. In this case IC2 counts hundredths of a second and IC3 counts tenths.

Once your friend has let the counter run, you stop the counting by stopping the clock (IC1). The Reset input of the clock IC is normally held high by R3 and this enables the clock. Pressing

PARTS LIST

● resistors

(1%, 0.25 W)

R1	560Ω
R2	4.7k
R3, R4	10k
R5, R6	2.2k
VR1	5k mini horiz. trimpot

● capacitors

C1	1uF 16VW electrolytic

● semiconductors

D0 - D19	5mm red LEDs
IC1	7555 CMOS timer IC
IC2, IC3	4017 CMOS decade timer

● miscellaneous

SW1, SW2	Push-to-make pushbuttons (red, white)

Stripboard 76 x 88mm (34 strips x 29 holes), 2 x 1mm terminal pins, 9V battery clip, 8-pin IC socket, 2 x 16-pin IC sockets.

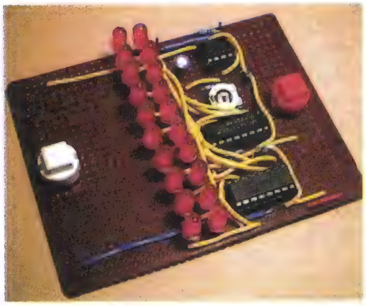


Fig.1: A simple 7555 oscillator drives a series of decade counters. Your reaction time is read off the two rows of 10 LEDs.

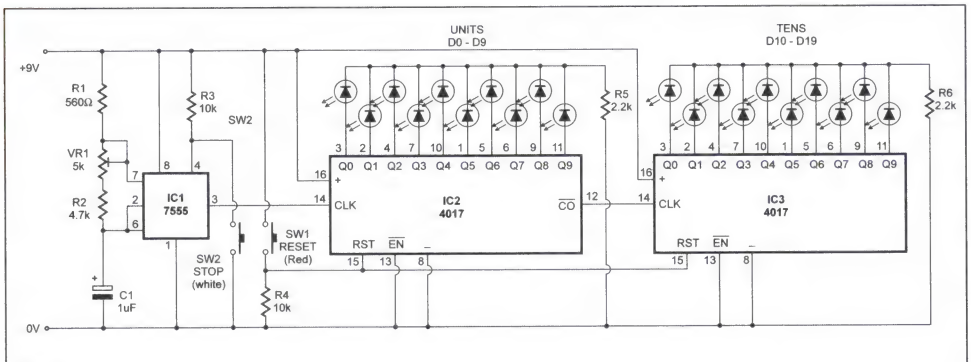


Fig.1

SW2 takes the Reset low, and pin 3 goes to 0V and stays there for as long as you hold the button down.

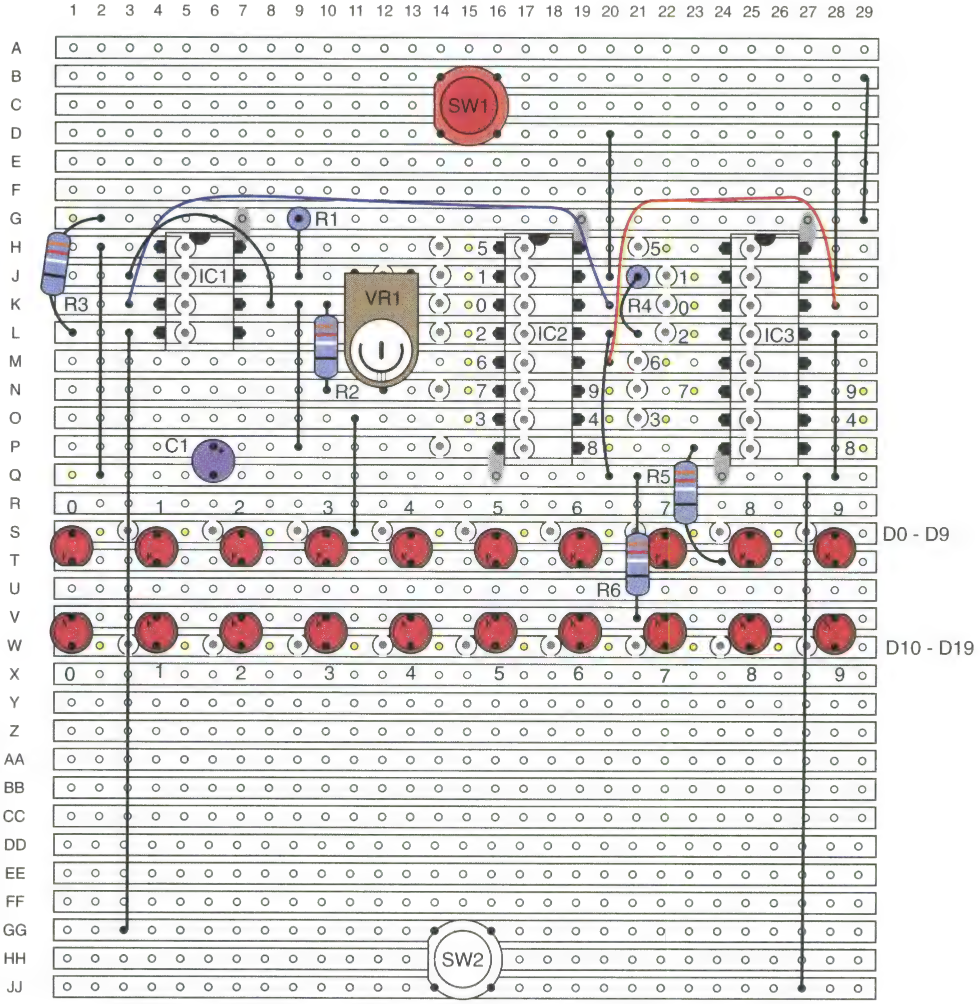


Fig.2: There's rather a lot of strip board used here, but we'll be adding more to this project next month.

Construction

Some people like to buy a few components, drop them into the holes in the board and have a circuit built and running in under half an hour. This month we are catering for those who like to have lots of components and connecting wires and spend a few hours exercising their skills at neat soldering and getting the wires into the right holes.

The total cost is close to the $10 mark, so shop around for parts. Different retailers charge widely different amounts for essentially identical LEDs. We have been asked prices ranging from 16c to 25c (at the 10 or more rate). With 20 LEDs to buy, the unit price is important.

This project is built on a larger board than is strictly necessary. You could use a smaller board if you move S2 closer to the LEDs. However, we intend in a future issue to describe how to expand this project to make it into a lap timer for model racing cars (or for people, come to that), and will have an optical circuit to trigger the timing. The extra space on the board is for the ICs that this extension will need.

Build the clock circuit first (including SW2) and then test its output at pin 3. It runs too fast for a voltmeter to follow and should give an average voltage reading of about 4.5V, falling to zero when SW2 is pressed. If your multimeter can measure frequency, you should be able to adjust VR1 to bring the output frequency to 100Hz, otherwise, we will deal with calibration later.

Next, assemble IC2, SW1 and the top row of LEDs. The numbers beside the IC in Fig.2 indicate which pin should be connected to which LED. Make the link between IC1 pin 3 and IC2 pin 14. Apply power and the LEDs should scan rapidly from left to right. The display is deliberately made fairly dim by the high value of R5. This is because we are driving the LEDs directly from the CMOS outputs of IC2, without using buffer transistors.

We have found that counting is perfectly regular in our prototype, but if you find it erratic, try connecting a 100nF greencap across the power supply to IC2 as near as possible to its power pins, 8 and 16. Of course, there might be other reasons for some of the LEDs failing to light. You may have connected one or more with the wrong polarity. The 'flat' on the rim should be on the same side as the white button. There may be open circuits or, as we found when testing our prototype, an unintentional solder blob connecting the cathode and anode wires of one of the LEDs, so shorting it out. Check that the display shows '0' when S1 is pressed and held. Check that it stops scanning when S2 is pressed and held.

Finally, assemble IC3 and the lower row of LEDs and test it as above. Note that these LEDs have their flats toward the *red* button. To calibrate the circuit, use a frequency meter as described above or let the circuit run and measure the time for a number of complete scans of the lower row of LEDs. For example, 30 scans should take 30s. Adjust VR1 to obtain this timing. The circuit is then ready to run!

Higher precision

This can be achieved in two ways. One way is to make the clock run faster. For instance, if you find that reaction times are always less than 0.2s, you can reduce C1 to a fifth of its specified value. A 220nF capacitor or two 100nF capacitors in parallel will have the desired effect.

Then you will have to divide the reading on the display by five to get the true timing, accurate to 0.002s. Another approach is to reduce C1 to 100nF and add an extra counting stage. This is another 4017 and ten more LEDs. There is room on the board for these additions. Now the system runs at 1kHz and the three rows of LEDs indicate the time in seconds to the nearest thousandth of a second. You won't be able to beat that — I assure you... **ea**

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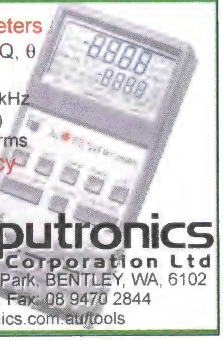

Measurement Parameters
Z, L, C, DCR, ESR, D, Q, θ
Test Conditions
100Hz, 120Hz, 1kHz, 10kHz
100kHz (MT-4080A only)
1Vrms, 0.25Vrms, 0.25Vrms
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Closing comments

Hopefully this article will have given you at least a basic idea of the technology options currently available for producing 'big pictures' for your TV viewing, and the main strengths and drawbacks of each.

It can still be difficult choosing the right model for your particular needs, but now you'll perhaps have a better idea of what to look for, and what to expect in terms of performance and price level.

My best advice is that if you possibly can, get yourself a demonstration of the big picture options that seem most likely to be right for you. Most of the larger department stores and specialist home electronics stores should be able to show you examples of at least some of the sets we've discussed in this article, operating in conditions close to those in a typical home viewing situation. That way, you'll be able to compare their strengths and limitations and be able to make a more confident buying decision.

By and large, I'd suggest that for most people it's probably best to stick with either a direct-view CRT set or a rear-projection set, deciding between the two on the basis of how large you want the picture to be. For 82cm or less, a standard CRT set is best; larger than that and you'll need a rear-projection model. Only consider a video projector if you have a very big viewing room (and a budget to match) and really want to go for a picture larger than 154cm.

In any case, if your budget allows by all means go for a set or projector with 100Hz display (for reduced flicker) and perhaps even line doubling (for less visible scanning lines). The larger the picture you go for, the more worthwhile these features become.

Don't leave your decision too long now, though – the Olympics are almost upon us! **ea**

NOTES and ERRATA

Computer Clinic (August 2000): The web address shown on page 83 is incorrect, and should in fact read http://proxomitron.cjb.net. "Many apologies for the inconvenience" says J.B. Cattley.

Basic Electronics (EA special issue): In the Voltage Doubler section on page 44, capacitor C2 in Fig.6a/b is shown with the incorrect polarity. That is, the positive end of C2 should connect to C1, and the negative end to the anode of D2.

Also, the regulated power supply circuit shown on page 50 (Fig.6) omits 10uF capacitor C4, which should be shown with its positive end connected to the junction of R1/R2, and the negative end to ground (-ve).

Circuit Design and Ideas (June 2000): Reader Phil Allison has this suggestion regarding the 'Golf Buggy Speed Control' circuit:

"The diode connected across the drive motor will have to carry the full motor current whenever the two mosfets are switched off, and this may be a great deal more than the 1 amp rating of the 1N4004. Also, the circuit switches at around 13kHz and this will increase the dissipation in the diode. A suitable type would be a high current fast diode, possibly a BY229/400 or even better a MBR745 Schottky (low forward drop) diode."

1 Megabit EPROM Programmer (January 2000): Author Glenn Pure recommends the following changes to the circuit:

R9 through to R12 should be changed to 75 ohm resistors, or even replaced with a 0 ohm link. These resistors provide short-circuit protection for the programmer's data outputs to the PC, but can cause the computer to see incorrect logic levels. This change also applies to the original 1993 programmer circuit, the basis of the newer 1Mb programmer.

Also, the two connections going to Vpp-L from S4 (the EPROM-type selector rotary switch) should really go to the Vpp-H line. However, this modification does not appear to be critical, as the programmer seems to work fine both before and after the mod. Note that this change only applies to those who have constructed the updated 1Mb EPROM programmer. **ea**

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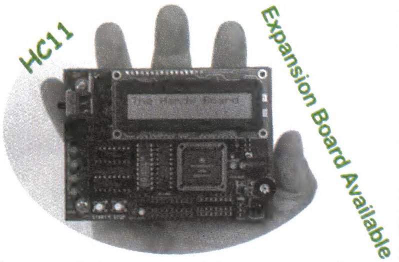

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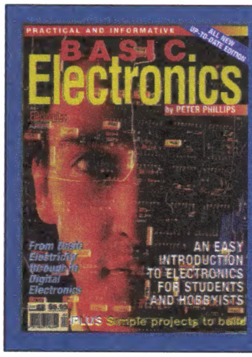
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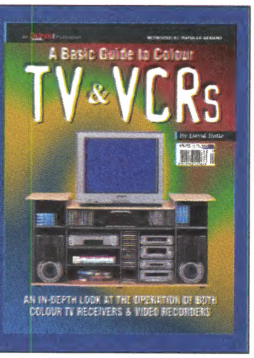
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WEB WATCH

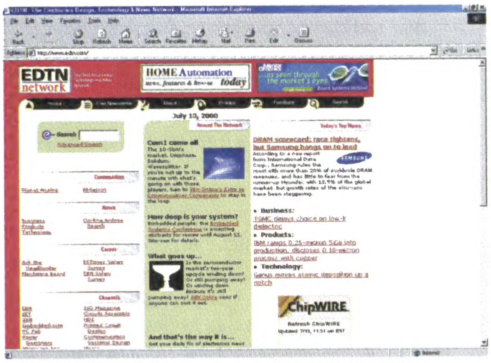
BY DARREN YATES

Valves & organic LEDs

THE INTERNET has become a global meeting-place where like-minded electronics boffins can swap soldering iron stories and their creations. One such place is Ben's Electronics pages at **www.electronics.xs3.com**.

While Ben admits the circuits are not his, there's plenty of interesting circuits that might spark ideas for your own imagination. Circuits are broken into 12 categories and there's roughly ten circuits in each category. We have to say that one or two circuits are outright dangerous, particularly the transformerless power supply with its supposed 120VAC mains input. When trawling through this sight, use your common sense. There is some good stuff in here but I just suggest you steer clear of anything with mains wiring.

IF YOU'RE in the electronics industry and you're having trouble keeping your head above water with all of the latest hi-tech developments, the Electronics Design, Technology and News network **www.edtn.com** is well worth looking at on a regular basis.



The site covers the latest news happenings on everything from printed circuit design to microwave engineering and then some. While the site isn't really designed for the electronics hobbyists, there's plenty of fascinating reading if you want to find out what's happening in electronics and what we'll be doing with it in a few years' – or even a few months' – time. Updated daily.

SOMEONE I ONCE worked with was quite proud of himself when he declared, "the valve is dead". I suppose ignorance is bliss for some. As with many things, the Internet has made information on valves far more readily available than at any time during their heyday.

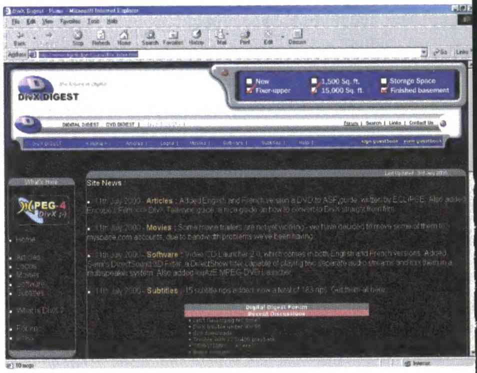
Nostalgia Air **www.nostalgiaair.org** is a US site that has loads of information, datasheets and schematics on-line. If you're interested in vintage radio and trying to revive that old set, this is one site to bookmark and keep as a reference. In fact, this site has circuit diagrams of just about every radio produced ready for free download. If you enjoyed building the 'Little Jim' a few months ago, this is definitely a great place to spend a quiet Saturday afternoon.

THESE DAYS, if you want to get into research, you need money — and lots of it. And it's no coincidence that it's the big name computer companies doing a good portion of it.

IBM, which just happen to have turned over $US87billion last year (that's about $500squillion Aussie dollars), has its finger in plenty of research pies and it's always interesting to read about what the lab boys in the white coats are up to next.

IBM's Research labs at **www.research.ibm.com** is the home page for everything from Chemistry to Deep Computing. Read about new organic LEDs (they use less power than conventional LEDs) or about IBM's new Microdrive, which stores 1GB of data on a 20-cent piece size platter. These guys are at the forefront of electronics so it's well worth a look.

FINALLY, PCs are getting to the point where they become really useful. While they've handled our word processing needs for years, it took some time before they could handle CD-quality audio. Now we're on the verge of a new horizon – digital video.



While VideoCD's tiny 352 x 288-pixel resolution has done nothing to advance the cause of quality, there's a new compression system that's well worth investigation – DivX MPEG4. it's a new high-compression codec that claims to give 80 to 90 minutes of 640 x 480-pixel video on a standard CD-R disc. The place to get all the latest info is **www.digital-digest.com/divx/index.html**, which also includes info on how to create your own DivX movies. **ea**

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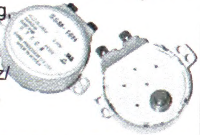

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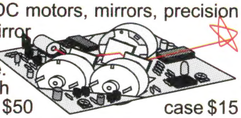

PAN / TILT DUAL SERVO CONTROLLER KIT: Ref. SC Jan 1998. This kit can be used to control two model radio control servos such as our MS1 servos. Two servos can be configured to rotate & pan a small camera (these parts are not included in kit). PCB measures 63 x 48mm and operates from 9-12V DC. The kit includes a PCB, all the on-board components, pushbutton, potentiometers, knobs, plastic case & a label: (K114) $19

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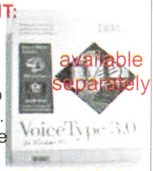

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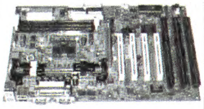

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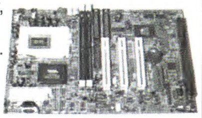

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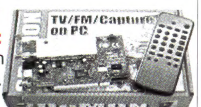

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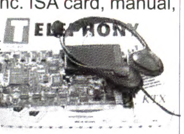

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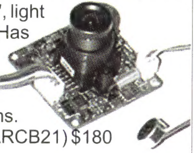

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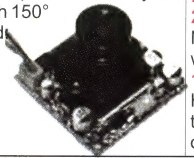

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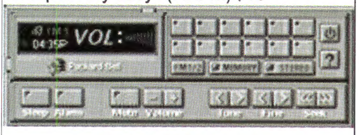

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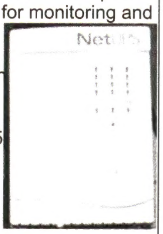

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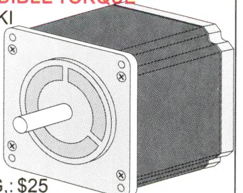

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